Rural Livelihoods and Constraints to Commercial Farming in Tanintharyi Region, Myanmar

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Myanmar is a country in rapid economic and political transition, with opportunities emerging for its smallholders to benefit from current economic growth. However many smallholders are trapped in semi-subsistence agriculture, disconnected from markets. Commercialisation can increase farm incomes, and - through the multiplier effect - lead to wider pro-poor growth in the rural economy. However, there are many constraints to commercialisation that prevent this process from occurring. While literature on constraints confronting smallholders abounds internationally there is a paucity of literature on the challenges confronting smallholders in Myanmar. This study investigates constraints to commercial farming in the townships (districts) of Myeik and Palaw in Myanmar's Tanintharyi Region. A representative two-stage sample of 259 rural households was drawn from these townships, and data relating to livelihoods, food security and agricultural enterprises were gathered using a structured questionnaire. Descriptive statistics presented in this paper provide useful insights into this poorly understood region. The most important determinants of commercialisation identified using Heckman regression were the household's land endowment, liquidity, land quality, and productive assets. Access to affordable financial services could boost household liquidity and investment in farm inputs, assets and improvements to land, so alleviating the most important constraints to commercial farming.

Key words: smallholder, commercialisation, market participation, rural development, rural finance, Burma

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Abbreviations

CDF	Community Development Facilitator
FCS	Food Consumption Score
GDP	Gross Domestic Product
HCI	Household Commercialization Index
MADB	Myanmar Agricultural Development Bank
NGO	Non-Governmental Organisation
OLS	Ordinary Least Squares
PCA	Principal Components Analysis
PPS	Probability Proportionate to Size
WVM	World Vision Myanmar

Chapter 1
Introduction

This thesis presents the results of research into the livelihoods of smallholders in Tanintharyi Region of Myanmar, and the constraints that they face to commercial farming. Chapter 1 provides context to this thesis by defining smallholder commercialisation and its relevance to Myanmar. The chapter goes on to identify the research significance and objectives. Finally, this chapter will outline the structure of this thesis.

1.1 Commercialisation as a development opportunity

There are a wide range of definitions of smallholder commercialisation in the literature. The consensus view tends to describe commercialisation as the process of transition from subsistence production toward an increasingly complex production and consumption system based on market engagement. While an increase in output market participation is the most obvious manifestation of this transition, this is driven by the increasing commercial orientation of the smallholder, where product choice and input use decisions are increasingly based on the principles of profit maximization (Abafita, Atkinson, & Kim, 2016; Jaleta, Gebremedhin, & Hoekstra, 2009; Pingali & Rosegrant, 1995; von Braun, 1995). A study by Tipraqsa and Schreinemachers (2009) conceptualizes agricultural commercialisation as the process by which farm households are increasingly integrated into seven markets: variable input markets (buying inputs that vary with the level of crop or livestock production), land markets, fixed input markets (farm equipment), food and non-food consumption markets, farm output markets, and labour markets. Despite the multidimensional nature of smallholder commercialisation, Leavy and Poulton (2008) note that 'the lynchpin of most, if not all, definitions of agricultural commercialisation is the degree of participation in the output market, with the focus very much on cash incomes'.

There exist severe constraints to commercialisation of smallholders. Literature documents a wide range of constraints across different countries and contexts, such as high transaction costs, insecure land tenure, lack of access to credit, and labour constraints (Barrett, 2008; Heltberg & Tarp, 2002; Ouma, Jagwe, Obare, & Abele, 2010; Pender & Alemu, 2007; Wynne & Lyne, 2003; Zeller, Diagne, & Mataya, 1998). While common themes emerge as to the most important constraints, there are context-specific differences in their relative importance, and the degree to which they constrain commercialisation. It is important that policy makers, development practitioners, donors, and agribusiness organisations are aware of the most binding constraints confronting a given group of farmers, in order to be effective agents of agricultural and rural development.

Myanmar is a country in rapid political and economic transition, having recently emerged from military rule. In 2011, a series of political and economic reforms introduced by former president, Thein Sein, opened the previously isolated country to trade. They also led, in 2015, to the first credible election of a civilian government in five decades (Nwe, Kawata, & Yoshida, 2018). Myanmar is rapidly globalising, with opportunities opening for investment and trade. The economy is forecast to grow at 6.8% in 2018, and 8.2% over the medium term (Asian Development Bank, 2018; World Bank, 2016). Recent Myanmar government policy recognises the importance of agricultural growth to the country's overall economic development, prioritising agricultural development as a key development strategy and policy area (Government of Myanmar, 2012; Kyi, 2016). Local research that provides evidence-based recommendations on agricultural development could be of great value to inform better policy and interventions.

Most of the current literature on constraints to smallholders is from an African context. The literature on Asian smallholders largely dates from the Green Revolution of the 1960's and 1970's, when high-yielding varieties enabled the commercialisation of smallholders in a large number of Asian countries (Hazell, 2009). Africa largely did not share in the Green Revolution, which has prompted further research on the constraints facing African farmers, while attention shifted away from Asia.

However, not all Asian countries made the same progress towards smallholder commercialisation following the Green Revolution. Myanmar is one of these countries. Myanmar has low agricultural productivity compared to its South East Asian neighbours (Tun, Kennedy, & Nischan, 2015), and is the poorest country in South East Asia, with 25.6% of its population living below the national poverty line (Asian Development Bank, 2016). Agriculture is a crucial sector for Myanmar, contributing 43% of its GDP and being the main livelihood activity for nearly 70% of the population (Haggblade et al., 2014).

There is potential for agricultural growth to be a major driver of poverty reduction and overall economic growth in Myanmar. Agricultural growth is important and, some literature suggests, necessary for broad-based economic growth (Dethier & Effenberger, 2012). There is an historical precedent for the importance of agricultural growth in the development of Myanmar's regional neighbours, with agriculture key to the development pathways of Thailand, Vietnam, Indonesia, and Malaysia (Tun et al., 2015). While the changing political and economic environment in Myanmar presents opportunities for smallholders to benefit from globalisation and economic growth, these benefits are by no means certain. If farmers are disconnected from markets, they will be excluded

from economic opportunities that globalisation presents. Connecting farmers to markets provides linkages that pass some of the benefits of growth back to rural communities.

Not only do the constraints confronting smallholders prevent them from benefitting from a liberalising economy, but they also slow rural growth itself. Increased farmer incomes have a multiplier effect on the rural economy, leading to increased economic growth and poverty reduction. Poor farmers who earn increased income through commercialisation tend to spend most of that money in the local economy on non-tradable goods and services (Mellor, 1999). These non-tradables use underemployed local labour and idle resources, resulting in job creation and pro-poor economic growth. Agricultural growth multipliers tend to be large when a rural economy is isolated, leading to a larger share of extra agricultural income being spent on labour intensive local goods and services that can be provided by underemployed people (Delgado, Hopkins, & Kelly, 1998). The rural economy of the study area in Tanintharyi is remote and populated largely by poor smallholders. Addressing constraints to commercial farming in Tanintharyi is, therefore, expected to reduce poverty levels in the Region's farm and non-farm households.

1.2 Significance of the study

Myanmar's smallholders face many constraints to commercialisation, which restricts an important pathway out of poverty. However, these constraints are poorly understood. There is little literature on the constraints that are relevant to smallholders in Tanintharyi Region, and no information on the relative importance of these constraints. There is a relative dearth of literature on Myanmar farm households, in particular in Tanintharyi Region. The proposed research will investigate constraints to commercial farming in the townships (local administrative regions) of Myeik and Palaw in Tanintharyi. This research will generate primary data and information on rural livelihoods and agricultural production of value to policy-makers and development practitioners. Identifying and ranking constraints to commercialisation will enable better informed and targeted development interventions and government policy in Tanintharyi, and across comparable regions of Myanmar.

1.3 Research objectives

This study aims to identify and rank the importance of constraints to commercialisation facing smallholders in Tanintharyi Region of Myanmar. Its specific research objectives are to:

- Inform development interventions through collecting, analysing, and presenting primary data on rural livelihoods and agricultural production in Tanintharyi.
- Identify and prioritise factors that constrain commercial farming in Tanintharyi.
- Formulate recommendations relevant to policy-makers and development practitioners to address these constraints.

1.4 Structure of the study

Chapter 1 of this study has introduced the concept of smallholder commercialisation, outlined the relevance of the study to Myanmar, and set the scene for the rest of this thesis. Chapter 2 reviews the literature on constraints to smallholder commercialisation. The research methodology employed in this study is explained in Chapter 3. The results chapters follow, with Chapter 4 presenting descriptive statistics on rural livelihoods and Chapter 5 presenting and discussing the results of the multivariate analysis on constraints to commercial farming. Chapter 6 draws on the results to present recommendations, and conclude this thesis.

Chapter 2
Literature Review

This chapter reviews international literature to identify a range of likely constraints to smallholder commercialisation, and draws on the small body of literature dealing with Myanmar to hypothesise which of these constraints are most relevant in Myanmar's Tanintharyi Region. Six main categories of constraints emerged from the literature review; functioning markets, liquidity, assets, household demographics, farmer characteristics, and enabling institutions. These constraints form the structure of this chapter. The literature is in wide agreement on what the various constraints to smallholder commercialisation are, however, the relative importance of these constraints varies between countries and contexts. Most of the literature within this review deals specifically with constraints to smallholder output market participation, but studies dealing with other aspects of commercialisation such as technology adoption, farm investment, and rural enterprise growth also informed this literature review.

2.1 Functioning markets

Functioning markets are essential for smallholder commercialisation. The literature consistently mentions lack of both input and output markets as one of the main constraints to commercialisation (Barrett, 2008; Ouma et al., 2010). The commonly accepted understanding of commercialisation relates to a process of transition from subsistence production toward an increasingly complex production and consumption system based on market engagement (Pingali & Rosegrant, 1995; von Braun, 1995). To engage in the market, farmers need to be able to access farm inputs both physically and financially. If the inputs are not physically available, or too expensive, then farm production will suffer. If markets do not exist for farmers to sell their products at a profitable price, then commercialisation is not possible.

The literature identifies high transaction costs as one of the most important constraints to farmers (Heltberg & Tarp, 2002). Much of the literature dealing with smallholder market participation deals primarily with the impact of transaction costs (Alene et al., 2008; Barrett, 2008; Burke, Myers, & Jayne, 2015; Goetz, 1992; Key, Sadoulet, & Janvry, 2000). Transaction costs can be defined as all the costs of entering into a contract, exchange, or agreement. High transaction costs increase the cost of commercialisation to farmers, for example, by increasing the time and money they need to spend transporting their produce to market, finding a buyer, negotiating a price, and ensuring that they get paid. In situations where farmers live long distances from towns with markets for their produce, the transactions costs can be very high. In some situations high transactions costs lead to exchange

being so difficult markets are said to be 'missing' (Ouma et al., 2010). For example, if the cost of travelling to sell a product is higher than the potential profit on that product, the market is 'missing'. The farmer will be unable to commercialise production of this crop. Transaction costs reduce the profitability of selling produce for the farmer, and lead to the rational decision not to commercialise.

Farmers need to access inputs like modern seed varieties, fertiliser, and agro-chemicals to achieve high yields. If farmers live too far from markets where inputs are available (thus incurring high transaction costs), or some inputs are simply not available, then production of a marketable surplus is constrained. If inputs are available at a high cost, the potential profitability of using these inputs is reduced, and the challenges for farmers with low liquidity increase. A survey of farmers in Mon state, which borders Tanintharyi, suggested that while 82% of farmers applied some level of fertiliser, application rates are just 37% of government recommended levels (Filipski et al., 2017), suggesting that there are constraints to applying fertilisers at rates to gain maximum potential yields.

Access to market information is one of the important factors influencing the proper functioning of markets (Heltberg & Tarp, 2002). High information asymmetries can exist between traders and smallholders when farmers do not know the market prices for their produce. A survey of smallholders from across Myanmar found that around a quarter of farmers had no price information before they sold their crop, and those that had price information usually got it from friends, family or the traders themselves (LIFT, 2012). Lack of access to market information decreases farmer bargaining power, increases transaction costs, and makes it less profitable to engage in the market.

One category of constraints to smallholder commercialisation most frequently highlighted in the literature relates to infrastructure constraints (Burke et al., 2015; Lapar, Holloway, & Ehui, 2003; Pender & Alemu, 2007). This includes transport, communications, irrigation, and electrification infrastructure. Poor transport infrastructure increases the transaction costs of obtaining inputs and selling produce (Barrett, 2008). A lack of communications infrastructure increases search costs, making it more difficult to get information on product prices and availability, to order inputs, and to sell produce (Jensen, 2010). A lack of electrification and irrigation infrastructure constrain on-farm activities by making mechanisation and irrigation more expensive or impossible. Alleviation of these infrastructure related constraints can increase smallholder commercialisation. For example, a Ugandan study found that a reduction in marketing costs due to the expansion of mobile phone networks led to higher market participation of farmers producing perishable crops (Muto & Yamano, 2009).

2.2 Liquidity

Low levels of liquidity limit farmers' ability to invest in the seasonal inputs needed to produce marketable surpluses (Fenwick & Lyne, 1999). Liquidity constraints also prevent farmers from investing in term assets, such as machinery and irrigation equipment. Liquidity can come from cash income, savings, or from credit. For larger commercial farmers, the cash flow from farm production, accompanied by seasonal credit, usually provides sufficient liquidity to finance necessary seasonal inputs. However, smallholders often earn low levels of income, which is insufficient to both meet household needs and reinvest in the farm. Cash earnings from the sale of farm produce are also often highly seasonal, and pressing household needs tend to drain cash reserves before the next planting season.

The literature suggests that when farmers have improved liquidity, through either higher household incomes or savings, or better credit access, the level of commercialisation increases (Abafita et al., 2016; Mauro, Lyne, & Nartea, 2010). For example, Abu and Haruna (2017) found that better access to credit, measured by financial inclusion, enhanced smallholder commercialisation in Ghana.

One of the most important sources of liquidity for farmers is access to credit. A 2012 multi-regional survey of smallholders found that less than 20% of Myanmar's population had access to formal financial services (LIFT, 2012), while Kloeppinger-Todd and Sandar (2013) estimate access to formal financial services at just 10%. Informal lending exists, but at very high cost (Duflos, Luchtenburg, Ren, & Chen, 2013). Some financial data are available for Mon State, which is adjacent to Tanintharyi Region. The average annualised interest rate in the Mon State survey was 148% for informal lending (Filipski et al., 2017), but even so, demand for credit was strong. More than 40% of the rural households in the Mon State survey had borrowed money from informal sources in the previous 12 months (Filipski et al., 2017).

Financial regulations in Myanmar have liberalised over the last decade, but are still restrictive (Sandar, 2017). Formal finance institutions were prevented from providing term loans with a maturity date longer than one year up until 2017, when the Central Bank of Myanmar extended this to a maximum three year maturity under Directive No. 7/2017 (Central Bank of Myanmar, 2017; Thein, 2018). This is still highly restrictive, limiting the ability of borrowers to finance productive assets with long pay-back periods. The Myanmar Agricultural Development Bank (MADB) is the largest formal financier for farmers, but primarily funds paddy farm seasonal inputs (Duflos et al., 2013). The maximum area of paddy that farmers can obtain loans for is 10 acres, and MADB does not finance higher value crops or fixed improvements (De Luna-Martinez & Anantavrasilpa, 2014). Lack of access to finance for investment in smallholder agriculture likely constrains Myanmar smallholder commercialisation.

Savings levels of smallholders in Myanmar are generally insufficient to finance inputs (Duflos et al., 2013). Low cash income means that many households have little disposable income to save. Also, past banking crises, inflation, and devaluation of currency by the military regime has eroded trust in holding savings as cash, particularly in banks (Duflos et al., 2013). Only 13% of rural residents surveyed in Mon state considered depositing money with a bank the best way to save, compared to 31% who perceived investing in jewellery was the best way to hold savings (Filipski et al., 2017). Assets like jewellery are not easily liquidated to finance seasonal inputs.

Many smallholders in Myanmar have some source of off-farm income, with Baver et al. (2013) suggesting 96% of smallholders in Shan State have off-farm income. A baseline survey conducted in 2011 across a range of Myanmar's states found that 53.8% of rural households' income was from casual labour (LIFT, 2012). Greater off-farm income means there is more cash available for financing farm assets and inputs. However, a study of Malawian smallholders has linked increased off-farm income with decreased agricultural production, as greater opportunities for income from off-farm sources results in a diversion of labour away from farm production towards more profitable activities (Alwang & Siegel, 1999). Increased off farm income helps alleviate liquidity constraints, but as liquidity constraints are eased through off-farm income, labour constraints may increase.

Remittances from migrant workers could be an important source of liquidity for Tanintharyi farming households. The borders between Myanmar and Thailand are porous, and migration to Thailand for employment is common. A study of rural households in Mon State (which is immediately to the north of Tanintharyi and is also contiguous with Thailand) found that 49.5% of surveyed households had at least one migrant abroad (Filipski et al., 2017). Of these migrants, 66% had made a remittance in the last 12 months. Remittances accounted for about 25% of total household income in rural Mon state, making them an extremely important source of liquidity. About 19% of these remittances were primarily used to fund buying agricultural land, and 6% used to primarily fund agricultural assets.

2.3 Assets

The productive assets that a smallholder owns has a significant effect on their ability to produce a marketable surplus (Barrett, 2008). The most important of these productive assets is land, with the area of land cultivated per household consistently appearing in the literature as a significant variable to commercialisation (Fenwick & Lyne, 1999; Mmbando, Wale, & Baiyegunhi, 2015; Olwande, Smale, Mathenge, Place, & Mithöfer, 2015; Randela, Alemu, & Groenewald, 2008; Woldeyohanes, Heckelei, & Surry, 2017). The majority of these studies find land endowment to have a positive effect, except Randela et al. (2008), who postulated that this was due to lower levels of productivity on larger land

holdings. Holding land quality constant, the larger the land area farmed by the household, the greater the potential crop production.

Actual crop production is dependent on the severity of other constraints, which dictate how much of the land area they can farm, and how productively they can farm it. In the case of food crops, the greater the quantity of crop cultivated, the more likely the household will have an excess of production over the household's own consumption requirements. Smallholders producing quantities of food near or below the household's food requirement face a trade-off between producing to consume themselves, or producing to sell to the market. Consuming what they produce themselves is often a safer livelihood strategy, and so small farmers not capable of producing surpluses above their own household requirement often do not sell much of their produce (Pender & Alemu, 2007). Smallholders with a small scale of production still incur many of the same fixed costs associated with accessing markets, acquiring information, and investing in bulky assets; making it difficult for farmers to produce and to access markets for their products (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009).

In addition to land, other productive assets allow the farm to produce a marketable surplus. On farm improvements, such as irrigation and drainage, allow increased crop yields. Investments in farm assets like tractors or storage facilities allow increased production and improved ability to deliver a product to market. Access to such assets is needed to farm productively, and to produce marketable surpluses (Heltberg & Tarp, 2002; Pender & Alemu, 2007). For example, Randela et al. (2008) found that South African smallholder households who owned transport assets were more likely to participate in the market, and Abafita et al. (2016) found that smallholder household ownership of draft oxen was linked to increased levels of commercialisation in Ethiopia. Across the various contexts studied in the literature, the types of productive assets that are important differ, but smallholders who possess productive assets are consistently more commercialised than their asset-poor peers.

2.4 Farm household demographics

One of the most important household characteristics affecting commercialisation is the availability of sufficient family labour (Alwang & Siegel, 1999). Farm production is labour intensive, and a lack of family labour means the household's farm production will either be constrained, or they must hire labour at additional cost.

Some literature suggests the seasonal labour shortages may be an issue in Tanintharyi due to high rates of migration to employment opportunities in nearby Thailand (Baver et al., 2013). A study in Mon State found that the high migration rates led to increased incomes for households from

migrant remittances, but also placed a strain on local labour markets (Filipski et al., 2017). Migration in this study was also typically selective, removing able-bodied and better educated members of the household from farm work.

The number of dependants in a household (e.g. children, the elderly and sick) affects the household's consumption requirements. For food-crop producing households, when the number of dependants is high relative to the household's labour endowment, (a high dependency ratio) a large share of the food produced is required to meet the family consumption requirements and is unavailable for sale. This constrains liquidity and hence production. Caring for dependants also reduces the labour availability of the household.

Gender of the household head is another characteristic that can impact on commercialisation. In some countries the gender of the household head influences the ability of the household to participate in markets, with women-headed households typically being less commercialised than male-headed households (Ouma et al., 2010; Pender & Alemu, 2007). For example, women often face higher transaction costs than men (Ouma et al., 2010) and face greater difficulties in land tenure security than men (Srinivas & Hlaing, 2015), due to the presence of informal institutions dictating gender roles. Srinivas and Hlaing (2015) present evidence of gender inequality in Myanmar land registration, showing that only 15%-20% of Land Use Certificates were issued jointly to a couple or solely in a women's name.

Household ethnicity may also influence the ability to participate in markets. A study by Baulch, Chuyen, Haughton, and Haughton (2007) in Vietnam found that geographic and cultural remoteness where responsible for lower levels of resource endowments of ethnic minorities, and also lower rates of return on these endowments. Vietnam has similarities in geography and ethnic diversity to Myanmar, with both countries having a large ethnic majority occupying the lowlands, and a multitude of ethnic minorities in the hinterlands. Language and cultural barriers increase transactions costs and create barriers to trade. Walton (2013) argues that ethnic minorities in Myanmar have historically faced oppression as a result of their ethnicity. Most of Tanintharyi's population is of Burman ethnicity, but the region is also home to a significant population of the ethnic minority Karen people (UNHCR, 2014). Karen may face barriers to participation in both output and input markets due to geographic and cultural distance from the centres of trade in Tanintharyi.

2.5 Farmer characteristics

The characteristics of the farm decision-maker can constrain commercialisation. Farmer education, experience, age, and gender influence levels of knowledge, skill, and capacity for physical work. For example, literacy and numeracy skills can help farmers to participate in markets and improve

production techniques. Mariano, Villano, and Fleming (2012) found that better educated farmers were more likely to adopt new farming practices in their study of smallholders in the Philippines. Theory suggests that as the level of education of the household head increases, the level of commercialisation increases (Mmbando et al., 2015; Pender & Alemu, 2007).

Age and experience can increase skill, and foster respect in the community; which reduces transaction costs. However, old age can also reduce the physical capability to work on the farm, the drive to engage in the market, and the tendency to adopt new techniques. Ouma et al. (2010) found that in Central Africa, farmers age and experience was positively related to the probability of participating in the market as a seller, however Abafita et al. (2016) find in a study in Ethiopian that younger households are more likely to participate in agricultural markets. Studies often find farmer age to be a significant variable, but the direction of the impact differs, suggesting a range of other cultural and context specific factors are more important to commercialisation than farmer age.

2.6 Enabling institutions

Many formal enabling institutions were established to achieve government policy objectives such as land tenure security and provision of extension services. Other enabling institutions are informal, such as cultural preferences in patterns of production or consumption, and where household incomes are allocated.

Secure land tenure is an important enabling factor for commercialisation of smallholders. It gives farmers confidence that investments made in land will be protected, and that they will be able to realise a return on investment they make in fixed improvements. Farmers are unlikely to invest in their land if it can be seized by others. Land is also an important asset in providing collateral for credit, enabling easier access to finance (Feder & Feeny, 1991). De Soto (2000) goes as far as suggesting that insecure land tenure, and the resulting inability to leverage property to access credit, is the most limiting factor for economic growth in developing countries. Land ownership and the accompanying rights to lease or sell land also facilitate more efficient use of land and increased investment. For example, an empirical study in Central Africa found having a secure tenure system increased banana market supply by 6% (Ouma et al., 2010).

There is a history of land tenure security issues in Myanmar. During the period from 1988 to 2008 the military regime abolished the constitution, and there was widespread appropriation of land with no recourse to justice. In a 2013 survey of Shan State farmers, 100% of farmers said that they were ‘afraid of losing their land’ (Baver et al., 2013). In 2012 the Government of Myanmar made significant progress in formalising land tenure with the passing of the Farmland Law, and the Vacant, Fallow, Virgin Land Law. These laws set up a regulated land market ‘through the standardisation of a

private, predominately individualised, land use certification and registration system' (Mark, 2016). Land Use Certificate holders can now sell, mortgage, and lease their right to use land, which should address land tenure insecurity (UN-Habitat, 2012). A 2016 study in the Myanmar's Central Dry Zone found that 85% of farmers possessed secure land use titles (Hein, Lambrecht, Lwin, & Belton, 2016), however the 2016 Myanmar National Action Plan for Poverty Alleviation and Rural Development through Agriculture highlighted the need for accelerated land registration and certification (Government of the Republic of the Union of Myanmar, 2016). Challenges remain with the land registration process, with land administration systems under-resourced and fragmented (LIFT, 2016).

Despite legislative progress, Myanmar's history of land law changes under successive regimes has created what Mark (2016) calls 'stacked laws'. Contradictory historic land laws exist at the same time, creating a confusing legal system that is inaccessible to the poor and can be exploited by elites. Myanmar's history of expropriation of land may mean that many people do not trust the new land laws, and many do not understand or even know about them. Land tenure perception is as important as actual legal land tenure status in providing many of the benefits of secure land tenure.

Traditional customary land tenure management is prevalent in upland states inhabited by ethnic minorities, while in the predominately Burman lowlands concepts of private property and state property laws have more influence (Mark, 2016). Tanintharyi Region has a mixture of ethnic groups and degrees of isolation from main centres, which could mean there are differences in understanding of the impact of 2012 land tenure laws and tenure perceptions across the region. One report suggests that 9.3% of Tanintharyi's area is under just 42 private concessions (Baver et al., 2013), demonstrating the scale of historical land appropriation in the Region. Perception of land tenure could differ depending on the area of Tanintharyi farmers live in and the local experience with land security in the past. This has implications for the level of investment made by farmers, and the efficient functioning of land markets.

Another important enabler of smallholder commercialisation is agricultural extension services. These services contribute to farmers' ability to increase productivity, production, and connect to markets (Mariano et al., 2012). The more contact farmers have with quality extension services and agricultural training, the greater their capacity to commercialise.

Chapter 3
Research Methodology

This Chapter describes the sample study design and data analysis methodology. Section 3.1 discusses the selection of sampled households. Section 3.2 and 3.3 discuss the process of preparing the questionnaire and its implementation in the field. Finally section 3.4 describes the multivariate techniques used to analyse the data.

3.1 Sample survey design

3.1.1 Study area

This study was conducted as part of the baseline survey for the 'Tanintharyi Region Rural Income and Livelihoods Development Project', which is being implemented by World Vision Myanmar (WVM). The authors' University, Lincoln University, is a partner to the project, providing research-informed expertise. The Project has activities in the townships of Myeik and Palaw, in Tanintharyi Region. Figure 1 shows the location of Myeik and Palaw within Myanmar. The primary purpose of the baseline survey was for monitoring and evaluation of this project, with additional aims of informing the interventions developed as part of the project, and provision of data for this study. The survey design and study area selection stemmed from the need to ensure that the survey was representative of the projects' target area.

The study used structured interviews to collect information from 259 households across 14 villages in the townships of Myeik and Palaw. This survey had to be representative of rural households and statistically valid, yet manageable within the approved time and budget constraints. The Project partners agreed on seven study sites (strata) that would meet these requirements during the project's Launch Workshop in October 2017. Boundaries of village tracts (local administrative units) and geographical features such as roads were used to determine the boundaries of these study sites. Figure 1 shows the location of selected study sites that were identified as being representative of the wider area, and names the village tracts that these sites fall within. Study sites were in both coastal and upland village tracts in each district, and two study sites were in areas that would not be targeted by the project. These two sites are control sites for future monitoring and evaluation of the Projects effectiveness. Study sites were also chosen to include the diversity of agricultural enterprises, distance from urban centres, and population ethnicity across the townships.

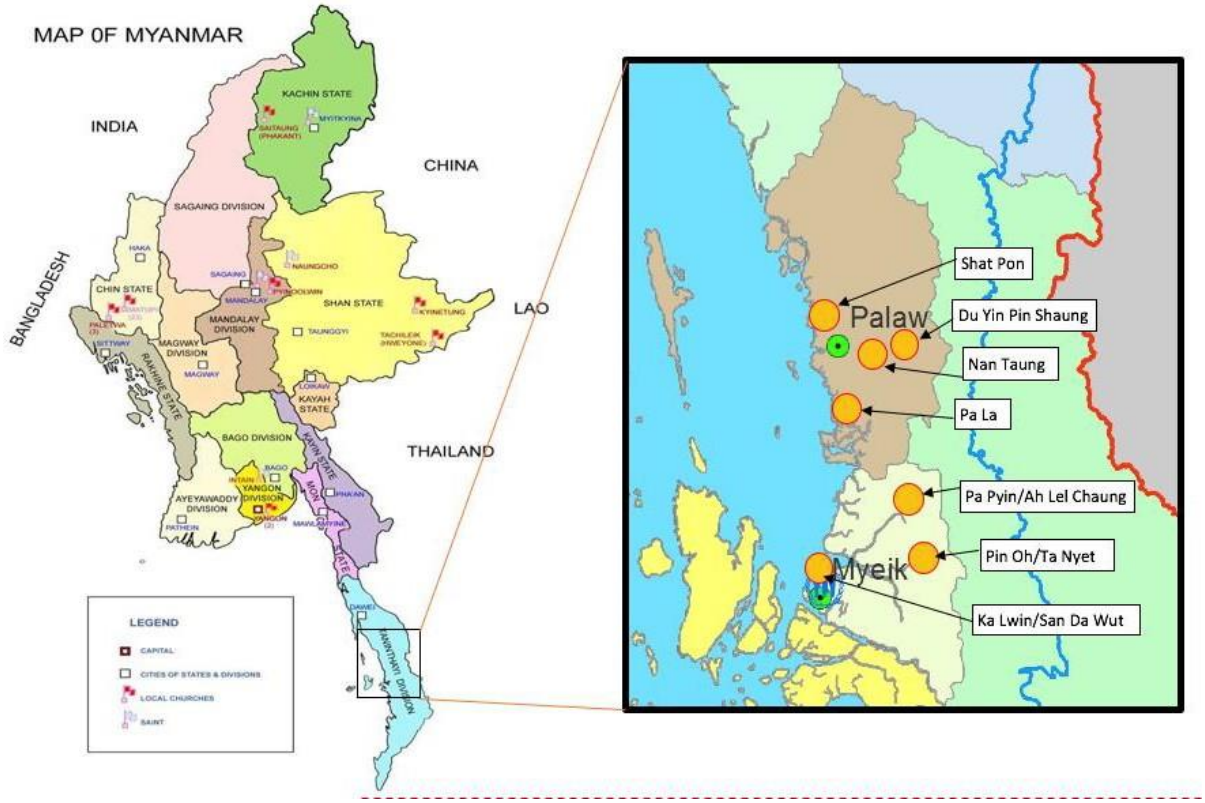

Figure 1: Map of Myanmar showing Tanintharyi Region, the townships of Myeik and Palaw, and the study villages

3.1.2 Survey design

Myeik and Palaw WVM staff listed the villages (primary sampling units) in each study site and obtained estimates of their population from official Myanmar government statistics. Together the seven strata accounted for 34 distinct villages, with an estimated population of approximately 39,000 people in 4,900 households. Two villages were sampled from each stratum with probability proportionate to size (PPS), where size was measured by the estimated number of households in each village. One village, Baing Pyin, entered the sample twice as villages were sampled with replacement to preserve PPS. Table 1 lists the villages available for sampling, population estimates used to sample with PPS, and sample villages selected.

WVM staff then visited the 14 sample villages, and, with the help of local village authorities, listed all households in each village by name. Households were then selected randomly without replacement at a constant rate of 12% from each sample village, yielding a total sample of 259 households. Table 2 shows the sample villages, actual number of households, and the number of households sampled in each village. This sampling rate was chosen to yield a sample large enough for the techniques used to analyse the data, but manageable within the time and budget constraints. This design produced a self-weighting sample of households at each site, allowing for estimation of unbiased sample statistics for each site without having to weight the data.

Table 1: Population of villages and villages sampled in the townships of Myeik and Palaw

Township (District)	Village tracts (Stratum)	Stratum characteristics	Villages	Estimated population	Estimated households	Sample villages
Myeik	Pa Pyin/Ah Lel Chaung	Inland (control site)	Ah Lel Chaung	572	95	
			Min Pyin	497	83	✓
			Kyauk Hpyu	371	62	
			Kyet Ma Oke	419	70	
			Pa Pyin	1,286	214	✓
			Yar Za Bar	359	60	
Myeik	Ka Lwin/San Da Wut	Coastal	Taung Pyo	1,421	237	
			Chaung Ku Ngal	1,450	242	✓
			Kywe Ku	2,190	365	
			Shwe Bay	1,976	329	
			San Da Wut	2,472	412	
			Kyaut Phyu Taung	1,234	206	✓
			Ywar Thit	445	74	
			Ma Yin Nge Hpyar	457	76	
Myeik	Pin Oh/Ta Nyet (Ku Lar)	Inland	Kyaung Taung	1,111	185	
			Pa Lone	1,181	197	
			Ngae Inn	704	117	✓
			Pin Oh	1,376	229	✓
Palaw	Du Yin Pin Shaung	Inland	Du Yin Pin Shaung	733	114	✓
			Sar Khe	316	43	
			Gyin Ni	348	55	✓
Palaw	Nan Taung	Inland	Gyint Gar	451	97	
			Hmaw Mi	412	79	✓
			Kyaung Naint	962	234	✓
			Nan Taung	646	151	
			Pein Hne Taung	457	79	
			U Yin Kan	423	89	
Palaw	Shat Pon	Coastal	Mee Laung Aw	293	38	
			Pyin Nge	1,099	175	✓
			Ta Hmyar	978	145	
			Tha Moke Taung	253	25	
			Yae Cho	694	73	✓
Palaw	Pa La	Coastal (control site)	Baing Pyin	491	95	✓✓
			Min Pyin	734	125	
Totals				**28,811**	**4,870**	**14**

Table 2: Number of households sampled in each sample village

Township (District)	Village tracts (Stratum)	Sample villages	Estimated households	Actual households	Sample households (@12%)
Myeik	Pa Pyin/Ah Lal Chaung	Min Pyin	83	75	9
		Pa Pyin	214	267	32
Myeik	Ka Lwin/San Da Wut	Chaung Ku Ngal	242	214	26
		Kyaut Phyu Taung	206	276	33
Myeik	Pin Oh/Ta Nyet (Ku Lar)	Ngae Inn	117	121	15
		Pin Oh	229	283	34
Palaw	Du Yin Pin Shaung	Du Yin Pin Shaung	114	115	14
		Gyin Ni	55	58	7
Palaw	Nan Taung	Hmaw Mi	79	79	9
		Kyaung Naint	234	208	25
Palaw	Shat Pon	Pyin Nge	175	143	17
		Yae Cho	73	118	14
Palaw	Pa La	Baing Pyin	95	101	12
		Baing Pyin	95	101	12
Total					**259**

3.2 Survey preparation

3.2.1 Survey instrument

A structured questionnaire was developed by the author and his academic supervisor with input from the Project partners, to meet the data needs of both the Project and this research thesis. A copy of the questionnaire is included in Appendix A. The questionnaire was then coded into SurveyCTO, a survey software that operates on Android devices. In the field, interviews were conducted using the SurveyCTO software on four Samsung Galaxy Tab A's, eliminating the need for paper questionnaires and transcribing data. The English paper version, and SurveyCTO transcript of the questionnaire, were both translated into Burmese by WVM's translators.

3.2.2 Field testing

On arrival in-country, the English and Burmese versions of the questionnaire were discussed with fluently bilingual WVM staff to ensure that the Burmese version captured the intended meaning of the English questions. The questionnaire was checked with WVM head office staff to make sure questions were culturally sensitive. Minor changes were made in response to feedback. At the Myeik

WVM office, the enumerator team and supporting WVM Community Development Facilitators (CDFs) were trained to administer the questionnaire, using the Burmese version to aid their understanding. The questionnaire was checked again for any sensitive questions and its appropriateness in the local context. A representative from Myanmar's Ministry of Social Development was present for the training, checked the questionnaire, and approved it for implementation. During the first few interviews, enumerators were supervised by the author in the field to answer any questions the enumerators had. Enumerators quickly gained confidence in their understanding and implementation of the questionnaire.

No application was made for Human Ethics clearance as the questions posed to respondents were of a non-personal nature and related to matters within the professional competence of the interviewees, as provided for by article 6.2.3, sub-article 2 of Lincoln Universities' Policies and Procedures, Human Ethics Committee. All contact with respondents was governed by WVM ethical protocols. Respondents were informed that participation was voluntary, confidential and anonymous, that they did not have to answer all questions, and that they could withdraw their information at any time. Enumerators were obliged to read respondents this information before continuing with the survey. Data from the survey will be anonymised before release to external parties.

3.3 Data collection

After training the enumerators were monitored by the author while they conducted interviews with respondents. The author rotated between enumerators to address issues as they arose, improve consistency between the enumerators, and to ensure that ethical protocols were observed. Each evening the data from the days' interviews were downloaded, checked, and any issues to address with enumerators identified. These issues were raised with the enumerators the following morning before returning to the field. This process ensured that all enumerators were well trained, monitored, and supported throughout the survey.

The sample households were identified by WVM CDFs, working with local village authorities (government-salaried local officials elected by the community). Before arrival in a sample village, WVM staff would first notify the village authorities of the survey teams intention to visit the community. WVM CDFs would arrange a meeting with the village authority, obtain their consent for the survey team to work in the community, and show them the list of selected households. When the team arrived to conduct interviews in the village, the village authority would then guide the enumerators to each household and introduce them. Enumerators interviewed respondents in Burmese or Karen languages, and entered data into the tablets in English. To assist the reader in

understanding the context of data collection, Figure 2 depicts a typical scene in field, while Figure 3 shows a meeting with a village authority to determine the location of pre-selected households.

Figure 2: Enumerator Ko Latt walking to survey household in Palaw township

Figure 3: Survey team in discussion with village authority

3.4 Data analysis methods

Section 3.4 describes the techniques used to identify and rank the importance of constraints to commercial farming. Section 3.4.1 begins by justifying the choice of a multidimensional dependent variable of commercialisation, and describing how this variable was calculated using Principal Components Analysis (PCA). Ordinary Least Squares (OLS) regression is determined to be suitable for

modelling the impact of postulated constraints on this commercialisation variable. Section 3.4.2. then discusses the problem of endogeneity that arises when using the OLS model, and the use of Heckman's two-step process to account for endogeneity

3.4.1 Principal Components Analysis

The literature on smallholder commercialisation describes a plethora of approaches to quantifying commercialisation, without consensus on how best to measure commercialisation or on methods to analyse it. Jaleta et al. (2009) note that most of the literature considers market participation (in output markets) as synonymous with commercialisation, and neglects the market orientation aspect of commercialisation (i.e. a purposeful intention to participate in the market based on market signals). Yet the commonly accepted definition of commercialisation treats it as a process of transition from subsistence production toward an increasingly complex production and consumption system based on market engagement (Pingali & Rosegrant, 1995; von Braun, 1995).

Most empirical studies have used the quantity of a crop sold as their dependent variable (Abdullah et al., 2017; Goetz, 1992; Martey, Etwire, Wiredu, & Ahiabor, 2017; Mmbando et al., 2015; Olwande et al., 2015), although many of these studies sacrifice information by categorising quantity into an ordinal dependent variable to distinguish between households that are autarkic, net sellers or net consumers (Bellemare & Barrett, 2006; Burke et al., 2015; Key et al., 2000; Woldeyohanes et al., 2017). Others consider multiple products and treat the aggregate value of sales as a measure of market participation (Abafita et al., 2016; Azam, Imai, & Gaiha, 2012; Heltberg & Tarp, 2002; Lapar et al., 2003; Nepal & Thapa, 2009).

These studies, to a greater or lesser degree, all fail to capture the farmer's level of market orientation or intention to participate in the market. Quantities sold and revenue earned reflect external factors like weather conditions and product prices in addition to farmer intentions. Some studies partially address this by formulating a Household Commercialisation Index (HCI), first used by Strasberg et al. (1999), which is measured as the gross value of all crop sales/gross value of all crop production (Abu & Haruna, 2017; Ochieng, Knerr, Owuor, & Ouma, 2016; Randela et al., 2008). Alene et al. (2008) combined the intensity of input use and output market participation in their dependent variable. Departing from the use of market participation as the dependent variable, Tipraqsa and Schreinemachers (2009) developed an index of output market *integration* rather than market *participation* by linearly combining indicators of market integration such as the distance to markets and the level of crop diversification.

The survey data gathered in this study provide several possible dependent variables capturing aspects of farm commercialisation, the obvious one being revenue earned from the sale of farm

products. However, farm income is not a robust measure of commercialisation, as annual farm incomes are affected by unanticipated events such as fluctuations in weather conditions. A better indicator of the *intention* to farm commercially would be expenditure on farm inputs (as used by Alene et al. (2008)) and investment in farming assets and fixed improvements. Whether or not the household's primary source of income is from farming is another useful indicator in the context of this study where households pursue a mix of farm, non-farm, and off-farm livelihoods. Other variables, such as the number of labourers hired, measure aspects of commercialisation such as integration into labour markets. No one variable captures all aspects of commercialisation, leading to the decision to use a multidimensional index as the dependent variable in this study.

PCA has been used in similar studies (Doll & Chin, 1970; Gadzikwa, Lyne, & Hendriks, 2007) to construct multidimensional indexes. This multivariate technique can produce a continuous, standardised index of indicators that captures most of the information contained in the indicators. PCA is often used to investigate relationships between variables (Doll & Chin, 1970) or to economise on the number of variables by constructing an informative index of these variables (Essa & Nieuwoudt, 2003; Nieuwoudt, 1972, p. 277). This index can then be used as either a dependent or independent variable in economic modelling (Doll & Chin, 1970). For example, Gadzikwa et al. (2007) used PCA to create an index of free riding behaviour in a farmers' organisation from four related measures of free riding, then used this variable as the dependent variable in an OLS regression model to explain free riding behaviour. A similar approach was followed in this study.

PCA converts a set of correlated variables into a new set of uncorrelated variables (principal components) that are linear combinations of the original variables. The first principal component accounts for the maximum possible share of total variation in the original values, the second principal component accounts for the maximum of the remaining variation, and so on until all variation is accounted for (Anim & Lyne, 1994). If the first principal component extracted from several indicators of commercialisation captures a sufficient amount of the variability in the indicators, it could then be used as a multidimensional index to measure the level of commercialisation. Combining several indicators of market integration into a continuous multidimensional index allows the estimation of an empirical model using OLS regression. Chapter 5 describes further the dependent variable created for this study using PCA.

3.4.2 Ordinary Least Squares regression

Given a continuous measure of commercial farming, the empirical model can be estimated by OLS regression of the function:

$$Y_i = \beta_0 + \beta_2 X_i + \varepsilon_i \quad (1)$$

where Y_i is the level of commercial farming observed for the i^{th} household, X is a vector of observed household and farm characteristics affecting Y_i, and ε captures random error assumed to be N.D.≈$(0,\sigma^2)$ and uncorrelated with X and Y. However, the parameters estimated using OLS regression could be biased and inconsistent as the error term may not be uncorrelated. This endogeneity problem stems from selection bias as many of the rural households sampled do not farm commercially, and the decision to farm commercially may be influenced by variables relevant to the OLS model - some of which were not observed and therefore omitted from the model. In this case, ε may well capture the effects of variables that are correlated with the dependent and independent variables.

Heckman (1979) suggested a two-step approach to account for endogeneity in this selection bias situation. In the first step, the decision to participate (in commercial farming) is modelled as a maximum likelihood probit function:

$$I_i = \alpha_0 + \alpha_1 Z_i + \mu_i \quad (2)$$

where I_i is a dummy variable that scores 1 if the i^{th} household is a commercial farmer, and 0 otherwise, Z is a vector of observed household and farm characteristics affecting the decision to farm commercially, and μ is an error term. The predicted values ($\hat{I}$) are then used to estimate the Inverse Mills Ratio:

$$\lambda_i = \varphi(\hat{I}_i)/\Phi(\hat{I}_i) \quad (3)$$

where φ and Φ are the density and cumulative distribution of a standard normal variate. The Inverse Mills Ratio measures the probability that a household decides to farm commercially over the cumulative probability of the household's decision. It is, therefore, a monotone decreasing function of the probability that a potential commercial farmer is selected into the sample of commercial farmers.

In the second step, λ is included in the OLS model to account for endogeneity introduced by selection bias:

$$Y_i = \beta_0 + \beta_2 X_i + \beta_3 \lambda_i + \varepsilon_i \quad (4)$$

If sample selectivity bias exists, the OLS regression estimate for β_3 will be statistically significant and the coefficients estimated for the other explanatory variables in the model will be consistent. On the other hand, if selectivity bias is not present, λ will not be statistically significant and may therefore be excluded from the model. Chapter 5 presents the OLS results obtained using Heckman's two-step

approach to identify significant determinants of commercial farming, and to rank their relative importance according to their standardised regression coefficients.

Chapter 4
Descriptive Statistics

This chapter presents descriptive statistics generated from the survey data. First, data on household characteristics such as household demographics, income, assets, and food security are presented, and important insights briefly discussed. The second section presents data related to the farm enterprises of surveyed households, covering farm characteristics and farm household characteristics, farm enterprise revenue, input expenditure, and productive assets. Data on land tenure, training and extension, and credit access follow, before a final section presenting information on the constraints to farming perceived by farmers. This chapter provides insight into rural livelihoods in Myeik and Palaw townships, and the context to discussion on constraints to commercial farming presented in Chapter 5.

These descriptive statistics were computed for 258 of the 259 rural households, as one case was an outlier and excluded from the analysis. The excluded case was the only commercial dairy farmer in the sample. The same statistics were computed for the subset of 116 (45% of households) non-farm households and 143 (55% of households) farm households in Tables 3-5 to enable comparisons between these groups. Farm households are defined as those who were engaged in the production of a crop or livestock product within the year preceding the survey. Some of the statistics presented in the tables are not reliable as their coefficients of variation (CV) exceed 20%. These unreliable estimates are indicated by enclosure in parentheses, and should be interpreted with caution.

4.1 Household characteristics

Table 3 shows that in many respects there is little difference in household demographics between farm and non-farm households, with similar statistics for the rate of female-headed households, age of the household decision maker, and level of education of the household decision maker. Surprisingly, despite farm households being typically located further away from urban centres, there is no difference in the travel time to a medical clinic. An important difference is in the percentage of ethnic minority Karen people who farm compared to the ethnic majority Burmese. There is a large difference, with just 11% of non-farm households Karen, while 39% of farm households are Karen. This confirms the author's field observation that Karen villages are typically located further from urban centres, and are more reliant on agriculture than are Burmese villages. Another difference is that the length of residency of the household head is much longer for farm households, at 44 years rather than 35 years, suggesting that non-farm households are more mobile.

Household size is similar between farm and non-farm households, at around 5.2 resident members. The number of resident children, adults, and elderly are also similar, but there is a large difference in the number of working adults, with 2.33 adults working in farm households, compared to 1.83 adults in non-farm households. This could be explained by higher demand in farming households for family labour. The number of non-resident family members is also higher in farm households, at 0.49 compared to 0.32 in non-farm households. This difference in the number of non-resident family could explain the difference in income from remittances between farm and non-farm households in Table 4.

Table 3: Household demographics in Myeik and Palaw study area, 2018

Household demographics	**All rural households (n=258)**	**Non-farm households (n=116)**	**Farm households (n=142)**
Female-headed households (%)	32	33	32
Households in minority ethnic groups (%)	26	11	39
Age of household decision-maker (years)	49	48	50
Education of hhld decision-maker (years of schooling)	4.3	4.4	4.2
Length of residency of hhld decision-maker (years)	40	35	44
Time to travel to a clinic (hours, expressed as a fraction)	0.4	0.4	0.4
Household size (number of resident members)	5.20	5.23	5.18
Number of children in the household (<16 years of age)	1.83	1.86	1.80
Number of adults in the household (16 – 65 years of age)	3.04	3.02	3.06
Number of elderly in the household (>65 years of age)	0.33	0.35	0.32
Number of working adults in the household	2.10	1.83	2.33
Non-resident family members	0.41	0.32	0.49

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

Average household gross income was 1,834,000 Kyat in 2017 (Table 4). With an average household size of 5.2 members, this translates to less than USD 1.00 per person, per day, well under the World Banks's current USD 1.90 per day extreme poverty line (Atkinson, 2017). However, these income estimates are understated, as wages earned by resident workers were not captured in the survey. Wage work is an important source of income, with 18% of households working for wages on farms, and 50% of households earning income from non-farm wage work. Farm wage work was the largest source of income for some 8% of households, and non-farm wage work was the largest source of income for 30% of households. Wage work is more important for non-farm households than farm households, (non-farm wage work is the largest source of income for 47% of non-farm households, but just 15% of farm households), and so the lack of data on wage income likely understates non-farm household income more than farm household income.

Table 4: Household income, 2017

Household income	All rural households (n=258)	Non-farm households (n=116)	Farm households (n=142)
Income earned			
Household gross income 2017 (Kyat '000) [1]	1,834	1,260	2,315
Household gross income from farming 2017 (Kyat '000)	759	0	1,426
Household gross income from business enterprises 2017 (Kyat '000)	659	799	(541)
Household income from remittances and transfers 2017 (Kyat '000)	318	291	(339)
Sources of income			
Households earning income from farming activities (%)	54	(2)	96
Households earning income from fishing (%)	(7)	(10)	(4)
Hhlds earning income from wage work on farms (%)	18	22	15
Hhlds earning income from non-farm wage work (%)	50	67	36
Hhlds earning remittances sent by non-residents (%)	19	23	16
Hhlds earning income from own business enterprises (%)	24	30	19
Hhlds earning income from pensions	(3)	(5)	(1)
Hhlds earning income from processing or trading locally produced food (%)	19	(15)	23
Largest source of household income			
Farming is the largest source of income (%)	34	0	62
Fishing is the largest source of income (%)	(5)	(8)	(1)
Wage work on farms is the largest source of income (%)	(8)	(9)	(7)
Non-farm wage work is the largest source of income (%)	30	47	15
Remittances sent by non-residents is the largest source of income (%)	(7)	9	4
Income from own business enterprises is the largest source of income (%)	16	22	10
Pensions are the largest source of income	(1)	3	0

Note: [1] 1 USD ≈ 1400 Kyat in 2017.
Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

Excluding wage income, there is a large difference in the income earned between farm and non-farm households, with farm households earning 2,315,000 Kyat, almost double the 1,260,000 Kyat income of the non-farm households. Farming accounts for 1,426,000 Kyat of farm household annual income, approximately 62% of total annual income. Farm households also receive more income from remittances and transfers than non-farm households. However, non-farm households are more

likely to be involved in business enterprises (30% of non-farm compared with 24% of farm households) and earn more income from these business enterprises, 799,000 Kyat compared to 339,000 Kyat in farm households.

The sources of household income reported in Table 4 point to important differences in the livelihood strategies of farm and non-farm households. Fifty-four percent of households earn income from farming, but many farm households do not rely on farming as their sole or primary source of income. Just 62% of farm households claim farming as their largest source of income, with wage work and business enterprises also being important sources of income.

Farming is still the most important livelihood activity in the study area, directly providing income for the 54% of households that farm, while 22% of non-farm households earn wages from working on farms, often as seasonal labour. Of the 30% of non-farm households who have a business enterprise, around half earn income from processing or trading locally produced food (15% non-farm households).

Despite the higher income levels of farm households, the rate of asset ownership of TV's and fridges/freezers is lower than non-farm households, as farm households typically live further from grid electricity and either run off solar panels, diesel generators, or live without electricity (Table 5). The number of bedrooms per household is also very similar, around 1.18. Farm and non-farm households both have the same rate of cell phone ownership, 78% of households, however the average number of cell phones per household is a little lower for farm households.

Farm and non-farm households score 55 and 57 respectively on the Food Consumption Score (FCS), a measure of food security (Table 5). Using this measure of food security, less than 1% of households in both groups are classified as 'food insecure', and more than 90% are 'food secure'. However, this measure is calculated by considering the respondents' diet in the week prior to interviewing them, and the survey was conducted at a time of year (after the rice harvest) that households are typically more food secure. Forty-one percent of households claimed that they had experienced food shortages in the past year, with an average food shortage duration of 1.16 months. While farm and non-farm households had similar FCS scores, non-farm households are much more likely to experience food shortages (57% of non-farm households compared to 30% farm households), and the duration of the food shortage is much longer (1.63 months compared to 0.78 months). The better food security of farm households could be due to a combination of higher household incomes, and partial or full self-sufficiency in production of food staples.

It is interesting that just 25% of farm households, and 13% of all rural households, were self-sufficient in rice production. As rice is the staple food crop, this statistic suggests that it is primarily farm households' higher incomes that is causing improved food security relative to non-farm households, rather than food self-sufficiency. While rural Myanmar livelihoods are often described as being based on subsistence rice farming, a relatively low percentage of the rural population of Myeik and Palaw townships subsists purely on their own rice production.

Table 5: Household assets and food security, 2017

Assets and food security	All rural households (n=258)	Non-farm households (n=116)	Farm households (n=142)
Household assets			
Households that own a cell phone (%)	78	78	78
Number of cell phones per household	1.40	1.49	1.33
Number of motorbikes owned per household	0.78	0.60	0.92
Number of bedrooms per household	1.18	1.17	1.18
Number of TV's per household	0.51	0.58	0.46
Number of fridges or freezers per household	0.04	0.08	0.01
Food security			
Food Consumption Score (FCS) [1]	56	57	55
Experiences food shortages at times during the year (%)	41	57	30
Average months per year household experiences hunger	1.16	1.63	0.78
Household self-sufficient in rice consumption (%)	13	0	25

Notes: [1] This study adopted the World Food Programme (2008) FCS index as a measure of household food security.

4.2 Farm enterprises

Tables 6-8 present information about farms, farm enterprises, enterprise incomes, expenditure on inputs, and farm assets within the subset of 142 farm households. As Table 6 shows, crop sales, which averaged 1,245,000 Kyat per farm household in 2017, are a much more importance source of revenue for farm households than livestock/livestock product sales, which averaged 153,000 Kyat per farm household. Farm input expenditure is 40% of crop revenue, at 497,000 Kyat. The average area of land owned is 5.62 acres, but 12% of farmers hire or borrow additional land, increasing the average area farmed to 6.03 acres. The area under irrigation is low, with 1.68 acres irrigated per farm in the wet season, and just 0.28 acres in the dry season. Most of the irrigated land is flood irrigated paddy fields, which receive water only in the wet season. The average number of workers hired in the peak of the season is 1.67. Producer organisations are uncommon, with around 5% of

farm households belonging to one, while the use of credit to finance farm inputs is more widespread, at 30% of farm households.

Table 6: Farm and farm household characteristics, 2017

Farm or farm household characteristic	Farm households (n=142)
Revenue from crop sales in 2017 (Kyat ’000)	1,245
Revenue from sale of livestock and livestock products in 2017 (Kyat ’000)	153
Expenditure on purchased farm inputs in 2017 (Kyat ’000)	497
Value of farm fixed and moveable assets owned	396
Area of land farmed (acres)	6.03
Area of land owned (acres)	5.62
Farmers hiring land in (%)	12
Area irrigated in wet season (acres)	1.68
Area irrigated after wet season (acres)	0.28
Number of workers employed on farm in peak season	1.67
Farm households that are members of a producer organisation (%)	(5)
Farm households that borrowed or used credit to finance inputs (%)	30

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

Table 7 shows that just four crop and livestock enterprises dominate agricultural production in the study area; betel leaf and nut, rubber, pigs, and paddy rice. Data on betel leaf and areca (betel) nut was aggregated, but individually these crops were both widely cultivated. Betel leaf is an important cash crop in the lowland areas, usually grown intensively under shade cloth with irrigation, while areca nut is a very important crop in the upland areas. Betel leaf and areca nut are the most important cash crops in the survey area, with 56% of farmers producing either one or both crops. Average annual sales per farm household of betel leaf and areca nut amounted to 596,400 Kyat, more than double the next closest crop, rubber, at 247,900 Kyat. Data are reported for eight other products grown by 1%-6% of farm households. A total of 27 different crops were identified in the sample, many grown by only one or two farmer respondents. Products are diverse, with some of the less common crops not reported in Table 7 including beans, chilli, cauliflower, and coconut.

Betel leaf and nut, rubber, pigs, and paddy rice dominate in average area farmed and sales per farm household. However, these main products are not necessarily the products with the highest revenue per grower. Betel leaf and nut earn the most per farm household and per grower, but pigs and paddy return less to growers than less commonly grown crops such as cashews, sugarcane, and groundnut.

Paddy rice is only grown by 29% of farmers, with upland rice grown by another 6%. Table 5 shows that 25% of farm households are self-sufficient in rice production, suggesting that a large proportion

of rice growers sell surplus rice. Indeed, the only crop grown purely for household consumption rather than sale is upland rice. It could be argued from this that most famers in the study area, while small scale, are commercially orientated.

Table 7: Main farming enterprises and sales revenue for farm households, 2017

Crop or livestock enterprise	Farm households (n=142)				
	Growers (%)	Area per farm household (acres)	Sales per farm household (Kyat '000)	Area per grower (acres)	Sales per grower (Kyat '000)
Betel leaf and nut	56	2.26	596.4	4.00	1,076.6
Rubber	35	1.82	247.9	5.29	783.3
Pigs	33		106.5		331.4
Paddy	29	1.54	165.6	5.35	583.8
Beef and buffalo	(6)		(35.9)		(637.5)
Cashew	(4)	(0.18)	(32.4)	(5.10)	920.0
Gourd	(5)	(0.06)	(31.0)	(1.18)	(628.6)
Sugarcane	(2)	(0.01)	(25.4)	0.48	1,200.0
Groundnut	(1)	(0.04)	(15.5)	(2.65)	(1,100.0)
Chickens	(6)		(8.8)		(156.0)
Cucumber	(3)	(0.01)	(8.8)	(0.45)	(312.5)
Upland rice	(6)	(0.09)	0	1.63	0

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

Labour and fertiliser are the most commonly purchased farm inputs, with 44% of farm households hiring labour and 47% buying fertiliser (Table 8). Hired labour accounts for the highest share of input expenditure across all farm households, and when the average is computed for just the users of hired labour, the 434,100 Kyat expenditure per user is close to double the amount spent on fertiliser. Livestock feed, livestock for fattening, and hire of machinery and equipment services also have high expenditure per user, but are less often purchased by farmers. Labour is an important cost for farmers, and as Table 4 shows, provides income for 18% of rural households. Farm households that hire labour pay wages equal to almost one-third of total income earned by non-farm households, highlighting the importance of farm work for rural livelihoods.

Table 8: Input expenditure and asset values for farm households, 2017

Inputs and assets	Farm households (n=142)		
	Users or owners (%)	Expenditure or asset value per farm household (Kyat '000)	Expenditure or asset value per user or owner (Kyat '000)
Input			
Hired labour	44	189.5	434.1
Fertiliser	47	109.3	233.4
Livestock feed	27	(58.5)	(292.7)
Livestock for fattening	14	(41.2)	227.6
Hired machinery and equipment services	25	45.4	184.0
Hired transport services	21	16.3	77.2
Insecticide and weedicide	36	11.3	31.7
Seed	23	11.7	53.3
Veterinary medicine and services	(7)	(1.5)	(21.7)
Asset			
Tractors	11	(125.5)	1,720.0
Threshing machine	(4)	(58.5)	1,660.0
Mill	11	(51.5)	457.2
Irrigation equipment	10	(27.3)	296.2
Trellises for vines	13	(23.3)	(245.4)
Storage facilities	(4)	(22.5)	(531.7)
Chicken and pig houses	18	(18.5)	(104.2)

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

Table 8 reveals that inputs necessary for high yields are likely not being used by many farmers. For example, around two-thirds of farm households do not purchase seed, insecticides or herbicides. A third of farm households produce pigs, 6% chickens, and 6% beef or buffalo, yet just 27% of farmers purchase livestock feed, and only 7% purchased veterinary medicine and services. This is consistent with the author's field observations, that agricultural systems are typically low-input, with resulting low yields.

In addition to being low input, farm enterprises operate with low levels of productive assets. The value of fixed and moveable farm assets is just 396,000 Kyat (Table 6), which is less than the annual expenditure on inputs. The incidence of farm household ownership of mechanical assets such as hand tractors and irrigation equipment is low, at 11% and 10% respectively. At a mean value of 1,720,000 Kyat, hand tractors cost more than average annual farm incomes, so these machines are significant investments. Just 18% of farmers owned chicken and pig houses, even though more than a third of farm households keep these animals. The incidence of hired machinery and equipment

services is reasonably high, at 25%, but even so many agricultural tasks are done using manual techniques.

4.3 Land tenure, extension services and credit

4.3.1 Land tenure security

Table 9 presents information on how farm households acquired their land, and their perceived ability to sell and lease this land. Inheritance and purchase of land are both common modes of land acquisition. Forty-three percent of farm households purchased their own land. A high percentage of households, around 86%, perceive that they can both sell and lease land. Table 6 shows that 12% of farmers leased land in during the 2017 season, demonstrating that there is an active rental market for farmland.

The presence of active land markets is a good indicator of secure land tenure (Place, Roth, & Hazell, 1994). This is a surprising finding given the history of land appropriation and legally insecure land tenure rights in Myanmar (Baver et al., 2013; McCarthy, 2016; Srinivas & Hlaing, 2015). Even if the legal status of tenure has been uncertain in Myanmar as Mark (2016) argues, farm households in the study area have been transacting land. Hayes, Roth, and Zepeda (1997) found that even within a customary tenure system in the Gambia, the rights of sale and use rights that this implies are associated with an increased propensity to make investments, which has a positive effect on farm yields. Regardless of the legal tenure status, the study area likely benefits from the effects of perceived land tenure security.

Table 9: Modes of farmland acquisition and perceptions of land transfer rights, 2017

Mode of land acquisition and perceived transfer rights	**Farm households (n=142)**
Households that acquired land through inheritance (%)	48
Households that acquired land through purchase (%)	43
Households that acquired land through allocation by authorities (%)	(9)
Households that perceive they can sell land (%)	87
Households that perceive they can lease land out (%)	86

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

4.3.2 Extension and training

Close to one-third of farmers (31%) claimed that they could get farming advice when they needed it. However, when asked for the name of the local extension officer, only 18% of farmers could recall their name (Table 10). Inability to recall the extension officer's name suggests that farmers had little personal contact with them, possibility because access was difficult or the quality of service poor.

Twenty-three percent of farmers were aware of agricultural training in the area in the past year, but less than half of these (11%) had participated in this training. The low rate of participation suggests that many farmers do not find the training sessions are worthwhile attending, or are unable to attend.

Table 10: Farmer awareness of agricultural extension and training, 2017

Extension and training	**Farm households (n=142)**
Farmers who can get farming advice (%)	31
Farmers who can recall the extension officers name (%)	18
Farmers who knew of agricultural training in the area in the past year (%)	23
Farmers who participated in local agricultural training in the past year (%)	(11)

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

4.3.3 Savings and credit use

Table 11 shows that just 10% of households hold cash savings in a financial institution. This low level of savings constrains the ability of households to finance seasonal farm inputs. Sixty percent of farm households reported borrowing cash in 2017, compared to just 22% of non-farm households. This is likely due to a combination of factors; but it points to the high demand for seasonal finance in agriculture, and the greater availability of formal finance. Agriculture has highly seasonal patterns of income and expenditure, placing cash flow constraints on poor households and requiring farm households to borrow for both purchasing inputs and consumption expenditure. In addition, farm households have easier access to formal finance through Myanmar's Agricultural Development Bank's (MADB), with around 12% of farm households accessing formal finance, while no non-farm households borrowed from formal sources.

There is a reasonably high incidence of short-term borrowing by farm households. Most borrowing is from either moneylenders or friends and relatives, with 23% of farm households using each source. Personal enquiry by the author within Myeik and Palaw townships confirmed the finding of Filipski et al. (2017) on informal finance rates in Mon State also applies in Tanintharyi; that moneylender interest rates are often 10% per month or more. A relatively small share of farm households, just 12%, borrow from banks or microfinance companies. The MADB provides short-term loans for seasonal inputs, mainly to rice farmers, but is not serving even half of the 29% of farmers who grow paddy rice in the study area.

The high use of moneylenders, lack of formal finance borrowing by non-farm households, and low levels of household savings suggest that other than the limited services of MADB, there is little access to formal finance for rural households. As even MADB does not finance term loans, rural

households have no access to affordable term loans for large investments. This explains in part the low incidence of farm assets observed in Table 8. Given the high capital cost of many assets relative to annual income, most households are unable to finance these assets.

Table 11: Household saving and credit use, 2017

Savings and credit use	All rural hhlds (n=258)	Non-farm hhlds (n=116)	Farm hhlds (n=142)
Households with cash savings in bank/savings association (%)	10	(9)	(10)
Households borrowed cash in 2017 (%)	43	22	60
Households borrowed from moneylenders (%)	16	(7)	23
Households borrowed from friends or relatives (%)	20	(15)	23
Households borrowed from banks or microfinance companies (%)	(7)	0	(12)
Households borrowed from savings groups (%)	(1)	0	(1)

Note: Sample estimates in parentheses have a CV greater than 20% and are therefore unreliable.

4.4 Perceived constraints

Figure 4 presents some of the most important constraints to farming perceived by farmers. Farmers were asked to identify the three most challenging problems that prevent them from making a better living from farming. The author identified themes in the responses and grouped them into categories of challenges. Many categories were observed, but some challenges were mentioned frequently. The top eight categories are presented in Figure 4.

Liquidity constraints and pests and diseases are by far the two most important challenges reported by farmers, with each being mentioned as the *most* important challenge by around 24% of farmers. Around 73% of all farmers mentioned liquidity as an important challenge, and around 65% mentioned pests and diseases as an important challenge. A third important category of challenge was a lack of knowledge and access to information, which was seldom mentioned as the *most* important challenge, but was seen as a problem by over 50% of farmers. The frequency of other challenges was relatively low, with water constraints, labour constraints, and a lack of farm assets/inputs being the only other constraints reported by more than 15% of farmers.

Data presented elsewhere in this chapter indicates why liquidity is the most important challenge perceived by farmers. Farm households are poor, earning on average 2,315,000 Kyat a year, of which just 1,426,000 Kyat comes from farming. Thirty percent of these farm households experience food shortages during the year, suggesting extreme cash shortages, and only 10% hold formal cash savings. Average expenditure on farm inputs is 497,000 Kyat, a significant share of household income, and 30% of farm households borrow to finance seasonal inputs. Even so, it is clear that farmers underinvest in both seasonal inputs, and the assets required to farm efficiently.

Pests and diseases covers a wide range of issues reported by farmers. Most common were issues such as rust fungus and mice damage in paddy rice, squirrels eating areca nuts, and premature death in pigs. Farmers often reported either not knowing what the pest/disease was, or how to control it. Although more than 65% of farmers reported problems with pests and diseases, only 36% purchased agro-chemicals (Table 8). Crop losses to pests and diseases were widespread, with some farmers reporting significant damage.

Around 30% of farmers reported lack of knowledge and access to information as their third most important constraint, often in connection with pest and disease control. Table 10 shows that just 11% of farmers attended agricultural training in the past year, and just 31% could get farming advice, which helps to explain why farmers identified lack of information as such an important problem.

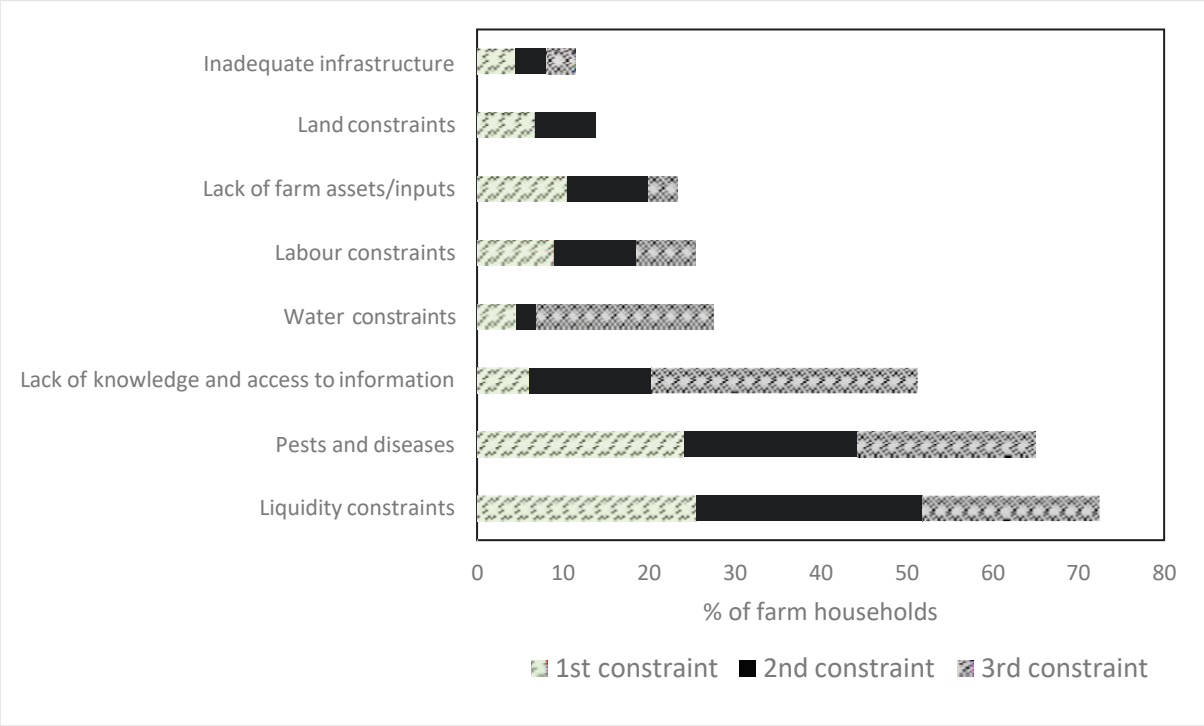

Figure 4: Key constraints perceived by farm households (n=142)

The other constraints listed are also supported by statistics presented earlier in this chapter. Table 6 highlights low levels of irrigation (water constraints) and small farm sizes (land constraints). Table 8 highlights the high proportion of farm expenditure spent on labour (labour constraints). Table 8 also shows the low ownership rates and values of productive assets, which coincides with the perceived lack of farm assets and inputs.

4.5 Summary

The descriptive statistics presented in this chapter provide the reader with an overview of rural livelihoods in the townships of Myeik and Palaw. Farming is the most important livelihood activity for rural households, with agricultural wage labour and business enterprises utilising local agricultural products also important sources of household income. The average household is poor, and many experience temporary food shortages.

This chapter also described agricultural enterprises in the study area. The most important agricultural products are betel leaf and areca (betel) nut, rubber, pigs, and paddy rice. Hired labour and fertiliser are frequently used inputs, but overall use of inputs and ownership of productive assets is reasonably low. Farm households have reasonably secure land tenure. Farmers have limited access to extension services and agricultural training. Borrowing to fund seasonal inputs is common, but usually through money lenders or family and friends rather than formal finance. The most important constraints to farming as perceived by farmers are liquidity constraints, pests and diseases, and lack of knowledge and access to information. This information provides context for Chapter 5, which presents a multivariate analysis of the constraints to commercial farming in Tanintharyi Region.

Chapter 5
Empirical Analysis of Constraints to Commercial Farming

This chapter presents the empirical regression model estimated to identify and rank constraints to commercial farming in the study area.

5.1 Regression model of commercial farming

This section defines the dependent and independent variables included in the empirical model of commercial farming.

5.1.1 The dependent variable

Section 3.4.1 described Principal Components Analysis (PCA) as a multivariate technique that reduces related variables to a smaller number of components or indexes that successively account for the maximum amount of variation in the original data. The first principal component extracted from the original variables accounts for the largest share of the variation. Table 12 presents the four variables used in this study to measure a farmer's integration with the market, and the loading or weight assigned by PCA to each of the (standardised) variables in the first principal component.

Table 12: Variables used to measure commercial farming and their principal component loadings

Variable	Variable definition	Variable loading
Farminc	Annual farm income (Kyat)	0.779
Farmexp	Annual farm expenditure (Kyat)	0.796
Fincbig	= 1 if farm income is the household's largest source of income, 0 otherwise	0.615
Workers	Number of farm workers hired in the peak season	0.719

Barlett's Test of Sphericity was significant at the 1% level of probability, indicating sufficient inter-correlation between the variables to extract principal components. The first principal component had an eigenvalue of 2.14 and accounted for 53.4% of the variation in the data. Subsequent components were ignored as their eigenvalues were less than unity. This implies that data reduction was achieved by first principal component alone as the remaining components accounted for less variation than that present in the original variables. Equation 5 presents the first principal component expressed as a linear index of the four indicators of market integration:

$$PC_{1i} = 0.779(Farminc_i^*) + 0.796(Farmexp_i^*) + 0.615(Fincbig_i^*) + 0.719(Workers_i^*) \quad \ldots\ldots(5)$$

where *i* represents the *i*th farm household in the sample, and the asterisk refers to standardised values. The loadings are all positive and of similar magnitude. This shows that the index of commercial farming increases with an increase in any of the indicators, and that the indicators

contribute more or less equally to the index as they accounted for similar shares of the variation captured by the first principal component. Index scores were computed for every farm household in the sample, and these scores were then regressed on the explanatory variables described in the next subsection. A frequency distribution of these standardised index scores appears in Figure 5. The scores were categorised into 24 groups ranging from <-2.75 to >2.75, each group representing 0.25 of a standard deviation. The data exhibit a reasonably normal distribution, with a positive skew indicating the presence of a few large commercial farmers in the sample. The absence of index scores below -1.25 suggests that there is a minimum level of commercial farming, below which households seek alternative livelihoods.

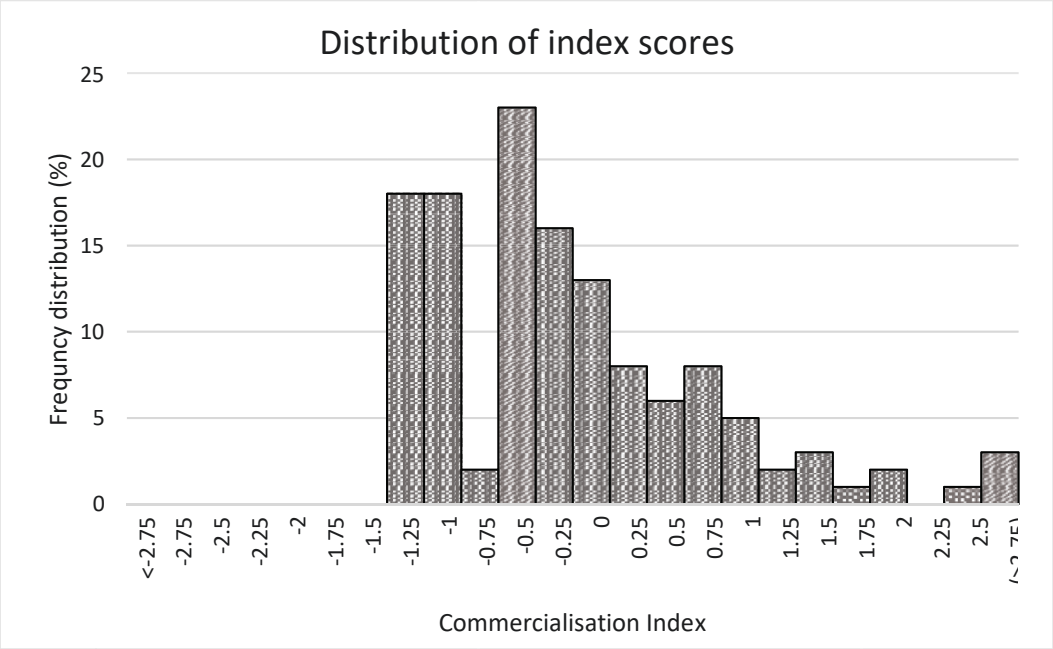

Figure 5: Frequency distribution of index scores

5.1.2 The explanatory variables

Table 13 presents variables expected to have an impact on the level of commercialisation of smallholders. These variables were selected from synthesis of a wide range of literature, in particular the work of Barrett (2008); Fenwick and Lyne (1999); Mauro et al. (2010); Mmbando et al. (2015); Olwande et al. (2015); Randela et al. (2008) and Woldeyohanes et al. (2017).

Table 13: Variables explaining the level of commercial farming

Explanatory variable	Variable definition	Expected impact
Land	Log(1 + acres operated per adult equivalent (AE[1]))	+
Equipment	Log(1 + replacement cost of all farm equipment per AE) (Kyat)	+
Liquidity	Log (1 + Household income per AE) (Kyat)	+
Labour	Resident adults per AE	+
Education	Years of schooling completed by the farmer	+
Age	Farmer's age in years	+
Gender	= 0 if male, 1 if female	-
Extension	= 1 if the farmer knew the extension officer's name, 0 otherwise	+
Training	= 1 if a household member participated in agricultural training in the past year, 0 otherwise	+
Ethnicity	= 0 for Bamar, 1 if ethnic minority	-
Services	Travel time to closest clinic (hours)	-
Upland	= 1 if household farms rubber or cashew, 0 otherwise	-
Tenure	= 1 if household purchased land, 0 otherwise	+

Note: [1]AE = (Adults + 0.5(Children + Elderly)) $^{0.9}$

The land, equipment, liquidity and labour variables are expressed per adult equivalent to account for differences in household size and structure. Adult equivalents were defined as (Adults+0.5*(Children+Elderly))$^{0.9}$ where the power term is included to capture size economies in consumption following Jenkins and Cowell (1994). Access to quality extension advice was measured by the farmer's ability to recall the local extension officer's name on the (reasonable) assumption that farmers who did not know the name did not have easy access to the extension officer or did not value the service provided. This differs from traditional measures based on the frequency of visits or subjective perceptions of access and quality. The measurement of land tenure also departed from more common approaches involving farmers' perceptions of their land rights. This study used a more objective approach and classified tenure as secure only if the household had purchased it's farmland, as this indicates that tenure is sufficiently secure to warrant a significant investment in land (Place et al., 1994). The dummy variable labelled 'Upland' is a negative measure of land quality, as uplands have steep slope and are not irrigable.

5.1.3 Regression results

OLS regression was used initially to model the impact of these explanatory variables on commercial farming without addressing the possibility of sample selection bias in the subset of rural households that engaged in farming. The results of the OLS regression are presented in Table 15 where they are compared with the results of a Heckman two-step regression that accounted for this bias.

As outlined in the Chapter 3, sample selection bias creates an endogeneity problem that can be addressed using Heckman's two-step process (Heckman, 1979). In the first step, a probit model was estimated from the full sample of rural households to predict the probability that the i^{th} rural household engaged in farming. Here, the dependent variable is dichotomous, scoring 1 if the rural household farms, and 0 otherwise. Table 14 lists the explanatory variables used to explain the household's decision to farm (or not to farm).

Table 14: Variables explaining the decision to farm

Explanatory variable	**Variable definition**
Labour	Resident adults per adult equivalent
Education	Years of schooling completed by the farmer
Age	Farmer's age in years
Gender	= 0 if male, 1 if female
Ethnicity	= 0 for Bamar, 1 if ethnic minority
Village topography	= 1 if village is located in a predominately upland area, 0 if the village is in a predominately coastal area
Services	Travel time to closest clinic (hours)
Remittances	= 1 if household receives remittance or pension income, 0 otherwise
Business	= 1 if household has a non-farm business, 0 otherwise

Table 15 presents the estimated probit model. The model was statistically significant and correctly classified 69% of the rural households as farm or non-farm households.

Table 15: Estimated probit model

Explanatory variable	Parameter Estimate	Z statistic
(Intercept)	-1.167	-2.202**
Labour	0.814	2.324**
Education	0.072	2.049**
Age	0.016	2.522**
Gender	0.023	0.125
Ethnicity	0.760	3.021***
Village topography	-0.587	-2.834***
Services	-0.171	-0.707
Remittances	-0.323	-1.530
Business	-0.551	-2.930***

Note: ***, ** show statistical significance at the 1% and 5% level of probability, respectively.

In the second step, the inverse Mills ratio was computed from the predicted probability of being a farm household (as described in Section 3.4.2) and included as an additional explanatory variable in the regression model. Table 16 presents and compares the un-standardised regression coefficients estimated for the OLS and Heckman models. Both the OLS and Heckman models are statistically significant at the 1% level of probability and both have R^2 values of 58%, indicating each is a good fit with the data. The inverse Mills ratio is not statistically significant, implying that the OLS estimators are unbiased (Heckman, 1979). Variance Inflation Factors (VIFs) for the OLS model range between 1.111 and 1.711, indicating the absence of severe multicollinearity (Kleinbaum, Kupper, & Muller, 1988). For these reasons, the OLS results presented in Table 16 were accepted for interpretation. Table 16 also presents the standardised regression coefficients estimated for the OLS model, as these indicate the relative importance of its statistically significant explanatory variables.

Within the subset of statistically significant explanatory variables, land endowment had the strongest impact on the level of commercial farming, followed by liquidity, land quality, productive assets, ethnicity, land tenure security, and the household's labour endowment. Education, age and gender of the household head were not significant determinants of commercial farming. Nor were exposure to agricultural extension services or training, or travel time to amenities and services.

Table 16: Estimated OLS and Heckman regression models

Explanatory Variable	Estimated regression coefficients			Rank	VIFs
	OLS Unstandardised	Heckman Unstandardised	OLS Standardised		
(Intercept)	-2.275***	-1.869***			
Land	1.991***	1.991***	0.529	1	1.711
Equipment	0.075**	0.077***	0.176	4	1.311
Liquidity	0.203***	0.216***	0.273	2	1.241
Labour	0.535*	0.400	0.121	7	1.111
Education	0.038	0.031	0.096		1.381
Age	-0.001	-0.003	-0.018		1.349
Gender	-0.114	-0.121	-0.053		1.160
Extension	0.183	0.203	0.069		1.246
Training	0.146	0.146	0.046		1.224
Ethnicity	-0.307**	-0.510**	-0.151	5	1.294
Services	-0.164	-0.131	-0.055		1.195
Upland	-0.403***	-0.419***	-0.196	3	1.388
Tenure	0.270**	0.253*	0.134	6	1.138
IMills (λ)		-0.162			

Note: ***, **, * show statistical significance at the 1%, 5%, and 10% level of probability, respectively.

5.2 Discussion of the regression results

The household's land endowment has a strong, positive, and highly significant impact on the level of commercialisation, with an impact approximately double that of liquidity, the second-ranked determinant. Households with more land per adult equivalent produce and sell more output, leading to higher levels of integration with labour and input markets, and increased farm income. Land endowment consistently appears as an important constraint in similar studies, across countries as diverse as Tanzania (Mmbando et al., 2015), Kenya (Alene et al., 2008), Ethiopia (Abafita et al., 2016; Woldeyohanes et al., 2017) and Bolivia (Larochelle & Alwang, 2015). The inclusion of the 'Upland' variable in the regression controls, to some extent, for differences in land quality. When quality differences are not accounted for and farm size is measured in terms of area, the household's land endowment may appear to impact commercialisation negatively simply because low quality land is more affordable than high quality land (Randela et al. (2008).

Household liquidity per adult equivalent is the second-most important determinant of commercial farming. This result was anticipated as households in the study area have low incomes and poor access to credit. More than 70% of the farm households sampled cited liquidity constraints as their most important perceived constraint. Inadequate cash flow constrains investment in farm inputs (Fenwick & Lyne, 1999; Mauro et al., 2010), leading to suboptimal yields and reduced surpluses for sale. In addition to the impact of liquidity on seasonal input purchases, households with higher levels of income are more capable of saving to invest in productive assets, or acquiring more land, alleviating two other highly significant constraints. Alleviation of liquidity constraints through increased household incomes, or improved access to affordable credit, would likely lead to increased commercialisation of farm households.

The 'Upland' variable has a strong negative impact on commercialisation showing that levels of commercialisation are lower amongst farm households that operate on steep, non-irrigated land - other factors, like land size, held constant. This third-most important determinant of commercialisation stresses the relevance of land quality when considering farm size. Land quality affects crop productivity, and thus marketable surpluses and commercialisation. In Tanintharyi Region, rubber farmers are often perceived to be relatively 'large', yet their average income is lower than that of 'smaller' betel farmers.

As was anticipated, the level of commercialisation of the farm household increases in response to growth in the value of farm equipment per adult equivalent. This relationship is well established in the literature (Leavy & Poulton, 2008; Pender & Alemu, 2007), with ownership of fixed assets linked to higher levels of production and greater surpluses available for sale. Barrett (2008) attributes smallholder engagement in markets largely to adequacy of productive assets, infrastructure and incentives, with suitable productive assets being a prerequisite for the

production of marketable surpluses. Fewer than 12% of farmers in the sample owned even one productive asset apart from low-value pig and chicken houses, suggesting that most farm households are constrained by lack of productive assets. Mmbando et al. (2015) contend that policies to support smallholder asset accumulation would increase smallholder productivity and market participation, while Barrett (2008) argues that barriers to market participation often depend on timely access to productive assets and technologies, which usually requires improved access to finance. Ownership of productive assets is highly dependent on household liquidity and access to affordable term loans to finance their purchase. Addressing rural finance constraints would boost household liquidity and promote asset accumulation. While it is quite likely that access to affordable term loans will encourage farmers to substitute machinery for labour, a potentially negative outcomes for non-farm households, increases in farm output and profitability will generate employment opportunities in agro-food chains and in the rural non-farm sector (Delgado et al., 1998).

Farm households belonging to the minority Karen ethnic group are less commercialised than Burman farm households. The regression coefficient estimated for 'Ethnicity' is negative and statistically significant, and its standardised value ranks the variable as the fifth most important driver of commercialisation. Karen households residing within the study area tend to live in ethnically homogenous villages in the hills, further away from urban centres than most Burman villages. Travel time, however, is not a significant determinant of commercialisation as the regression coefficient estimated for 'Services' is not significantly different from zero. The importance of ethnicity appears to stem from observed differences in livelihood strategies pursued by Karen and Burman households, and these differences may reflect cultural or language barriers confronting ethnic minorities in largely Burman markets. Overall, the results lend support to interventions aimed at integrating Karen into agricultural markets, and improving levels of inter-ethnic cooperation in the region.

Section 2.6 argues that households are unlikely to purchase land if they lack confidence in the breadth and duration of their property rights to the land. Land acquired in non-market transactions may not inspire the same level of confidence, especially in a region characterised by a history of dispossession. In this case, the positive and statistically significant regression coefficient estimated for 'Tenure' shows that levels of commercialisation are higher amongst farm households that have more secure land tenure. It is widely accepted that secure land tenure incentivises investment in agriculture (Place et al., 1994). Ouma et al. (2010) explain the link between the incentives provided by tenure security and increased commercialisation. They too find that tenure security promotes commercialisation.

The standardised regression coefficient estimated for 'Labour', although positive and significant at the 10% level of probability, ranks the availability of family labour less important than any other significant determinant of commercialisation. Literature suggests that sufficient family labour is a prerequisite for smallholder production (Alwang & Siegel, 1999), and empirical studies frequently identify household labour as an important determinant of market participation (Alene et al., 2008; Mmbando et al., 2015). The relative unimportance of 'Labour' in this study emphasises the importance of other constraints in this study, liquidity in particular.

Although 'Education' does not have a statistically significant impact on commercialisation, the regression coefficient estimated for this variable has a t-value greater than unity suggesting that formal schooling has a positive but weak impact on commercialisation. A similar finding was reported by Alene et al. (2008) in a study of market participation by smallholders in Kenya. Other studies find that education has a positive and significant impact on market participation (Mmbando et al., 2015; Olwande et al., 2015). The availability of non-farm employment opportunities may explain the weak impact of education in this study, as better educated adults tend to work off-farm, so reducing variability in the years of schooling measured for farmers.

The variables measuring agricultural extension and training (if the farmers knew the name of the extension officer, and if they attended agricultural training) did not have statistically significant regression coefficients. This raises concerns about the availability of good quality agricultural extension and training, as more than 50% of the sample farmers identified inadequate knowledge and information as one of their three most binding constraints, and more than 50% of those who knew of training courses in their area chose not to attend. Quality extension is often identified as the most important factor contributing to the adoption of new technology, which leads to increased commercialisation (Mariano et al., 2012). Many of the 'extension officers' identified by farmers in this study were neighbouring farmers, rather than people with professional expertise. In this context, the regression results do not imply that extension and training are unimportant, but rather that currently available extension and training services do not significantly increase the commercialisation of smallholders.

The age and gender of the household head were not significant determinants of commercialisation. With regard to age, arguments have been made for both a positive and a negative impact in the literature, and there is little consistency in empirical findings (Lapar et al., 2003; Mmbando et al., 2015; Randela et al., 2008; Woldeyohanes et al., 2017). Gender is generally found to be significant (Lapar et al., 2003; Woldeyohanes et al., 2017), with male headed households more likely to participate in the market, but results vary between regions and products. For example, Mmbando et al. (2015) found that gender influenced participation in markets for maize but not pigeonpeas in a Tanzanian study. The results of this study suggest that, within the Tanintharyi

context, market participation is not gender specific.

Travel time imposes a transaction cost on buyers and sellers. Studies conducted by Mmbando et al. (2015) and Martey et al. (2017) found that increasing distance from urban centres reduces the farmer participation in markets. Descriptive evidence gathered in this study and presented in Table 3 (Chapter 4) shows that both farm and non-farm households in Myeik and Palaw have good access to services, and the regression results confirm that location does not impact travel time.

Chapter 6
Conclusions

This thesis presented and analysed primary data on rural livelihoods and agricultural production in the townships of Myeik and Palaw located in Myanmar's remote Tanintharyi Region. It identified and prioritised factors that constrain commercial farming these districts using multivariate techniques. This final chapter summarises key findings in Section 6.1, and offers policy recommendations to address constraints to commercial farming in Section 6.2. Section 6.3 concludes the thesis by highlighting the limitations of the study, and suggesting areas for further research.

6.1 Major findings

Rural households in the townships of Myeik and Palaw are typically poor, earning less than USD 1.00 per person per day. At the time of the survey most households scored well on the FCS index, a measure of food security. However, 41% of households experience food shortages at some time of the year, indicating that a substantial proportion of the population struggles to provide for their basic needs. Forty-five per cent of the rural households sampled were classified as non-farm households as they did not raise crops or livestock. Nevertheless, farming is the main rural livelihood, with 55% of households earning income from their own farming enterprises, 18% earning income from wage work on farms, and many more operating, or working for, businesses that process or trade locally produced products. Farm households earn higher incomes, and have a much lower incidence of food shortages, than do rural non-farm households.

On average, farm households operated about six acres of land and generate farm incomes of 1,426,000 Kyat (approximately USD 1000) in 2017. Five products dominate agricultural production; betel leaf, areca (betel) nut, rubber, pigs, and paddy rice. In addition to these dominant five products, a wide range of other crops and livestock was observed, but none that were produced by more than 6% of farm households. Betel leaf and nut, and rubber are the most important cash crops based on sales per farm household. Pigs and paddy earn much less per farm household, but a portion of these products is often consumed by the household, which may contribute to their lower sales value.

Farms operate with relatively low levels of investment in inputs and mostly without productive assets such as hand tractors. The average value of farm assets owned by a farm household is very low, and less half of the farmers purchased fertiliser. Hired labour is single biggest farm expense, highlighting low levels of mechanisation and the importance of wage work on farms as a rural livelihood.

Farmers perceived their most important constraints to be inadequate liquidity, pests and diseases, and lack of knowledge/access to information. A multivariate analysis identified seven significant determinants of commercialisation. Listed in order of their relative importance, these constraints are the quantity of land, liquidity, the quality of land, value of farm assets, tenure security, ethnicity, and the household's stock of family labour. The household head's age and education were not significant determinant of commercialisation. Nor were familiarity with an extension officer, participation in agricultural training, or the travel time to services.

6.2 Policy implications

This study suggests that constraints to commercial farming faced by smallholders in Tanintharyi Region are significant, and that interventions to address these constraints would promote poverty alleviation and rural development. Interventions addressing the constraints ranked as of greater importance are more likely to be effective in achieving smallholder commercialisation and development outcomes.

Lack of liquidity is one of the main constraints to commercial farming in Tanintharyi. Smallholders, who dominate agricultural production in the Region, are too poor to save and reinvest in their farm operations at optimum levels, particularly in the case of productive assets with long pay-back periods. This problem is compounded by the lack of affordable formal credit. Other than the limited services provided by the MADB (which provides seasonal inputs loans for paddy farmers), farmers typically resort to loans from relatives and friends, or moneylenders at high interest rates (Chapter 4, Table 11). The problems of low liquidity and a lack of credit constrain the accumulation of productive assets and investment in production, leading to low levels of commercialisation, and low household income. This reinforcing feedback leads to a low-level equilibrium trap, where farmers are trapped in poverty. These important constraining factors of liquidity, access to credit, and ownership of productive assets are strongly interrelated.

In his discussion on escaping these poverty traps, Barrett (2008) recommends interventions to build assets and break down barriers to finance. Extending access to affordable formal credit is a key solution to the major constraints farm households face, directly addressing the liquidity problem, and enabling farmers to accumulate productive assets and land. Micro-finance institutions could have an important role to play in providing affordable credit. In addition to short-term seasonal input finance, farmers require mid-sized loans (meso-finance) for financing farm assets such as hand tractors, and assets that add value to agricultural produce such as rubber dryers. However, Myanmar's restrictive financial legislation currently prevents financiers from making term loans with maturity dates greater than three years. Financial products with short repayment periods are inappropriate for most smallholders and SME's with low liquidity, as many profitable investments will take longer than three years to repay. Reform of legislation to extend the maximum term of

loans would enable micro-financiers to develop financial products that better meet the needs of smallholders and rural entrepreneurs, reducing barriers to asset accumulation. It is recommended that loan term limits are relaxed to enable financial institutions to develop financial products that meet the needs of smallholders.

The MADB currently primarily provides financial services to paddy farmers, excluding the 71% of farmers in the study area who do not farm paddy. In addition to relaxing restrictive financial legislation, extension of MADB seasonal input finance to producers of all agricultural products would promote smallholder commercialisation and rural development. The wide national coverage of MADB presents an opportunity for the rapid expansion of affordable seasonal finance to smallholders.

While small farm sizes are a major challenge to commercial farming, there is evidence of an active land market, which can help to alleviate land constraints through lease or sale. The Government of Myanmar has made progress on formalising land tenure with the passing of the 2012 Farmland Law, which grants the right to sell or lease use rights to land (UN-Habitat, 2012), however as recently as 2016, certification of farmers land use rights was incomplete (Hein et al., 2016). Continued efforts are required to provide Land Use Certificates to all farmers, and to uphold farmers' right to transact farmland. Achieving this will require the modernisation of national land information management systems and administration. Policy must engender confidence in land holders that they possess an assured, durable and broad bundle of rights over the land. While land endowment was by far the most important constraint to commercialisation, interventions exhorting amalgamation of small farms are not recommended due to concerns around the welfare of very small scale farmers. Landless households have, on average, lower incomes than farm households. Steady progress towards allocative efficiency through well-functioning land markets, particularly land rental markets, will gradually shift land to more commercialised farmers without dispossessing smallholders or escalating distress sales.

The Region's current extension services and agricultural training have low outreach and no significant impact on the level of commercialisation of farmers. Farmers frequently reported inadequate information as a challenge, indicating a need for effective extension and training. The few government and NGO extension service providers operating within Tanintharyi Region may already be aware that both the quality and scale of their services are lacking. The relatively good telecommunications network in the region, and high rates of mobile phone ownership, present new opportunities for low cost information dissemination to farmers from government agencies and NGOs.

Lastly, the results show that Karen households are less commercialised than Burman farmers, even

after accounting for differences in land quality and location. Lower levels of commercialisation observed amongst Karen farm households may reflect differences in their livelihood strategies resulting from language and cultural barriers that confront Karen with increased transaction costs in markets where most buyers are Burman. These inequalities should be recognised and tackled by agencies implementing agricultural development activities in the region. In particular, the results of this study lend support to interventions aimed at integrating Karen into agricultural markets, and improving levels of inter-ethnic cooperation in the region.

6.3 Limitations and areas for further research

This study's analysis of rural livelihoods is limited by lack of data on wage incomes other than those remitted by migrant workers. Information about locally earned wages was not collected owing to concerns about the sensitive nature of the question. However, wage income may be a significant source of income, especially for non-farm rural households. This omission understates the estimates of household income reported in Chapter 4, particularly for non-farm households.

Endogeneity was addressed in this study using the Heckman (1979) two-step method to estimate and include the Inverse Mills Ratio in the OLS regression. While fit for purpose, this method has been superseded by more sophisticated techniques such as 2SLS regression with instrumental variables in current literature.

This study was conducted as part of the baseline survey for the 'Tanintharyi Region Rural Income and Livelihoods Development Project', which produced cross-sectional data for the analysis. The same households will be surveyed again on completion of the project to assess its impact and to estimate the financial return to the sponsor's investment. This provides an opportunity for gathering panel data to confirm the results of this study. The use of cross sectional data, with a modest sample size, did limit the precision of some sample estimates. Descriptive statistics with coefficients of variation exceeding 20% were treated as unreliable and interpreted with due caution. Future researchers should make the most of the opportunity to test the findings of this study with the panel data that will be collected.

Further research topics abound within this poorly understood region. Application of this research to development practice would benefit from further research identifying the most efficient interventions to alleviate the constraints identified in this study. This would help to inform the work of government and NGOs. Understanding the effectiveness of different financial products to alleviate liquidity constraints and build assets would be of particular value.

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Appendix A
Survey Questionnaire

Household survey questionnaire to gather baseline data for a World Vision project that will help to improve the quality of food produced and sold in Myeik and Palaw Townships

INFORMED CONSENT AND DECLARATION

Participation in this survey is voluntary, and the respondent does not have to answer questions that they consider sensitive or private. Individual responses will be treated confidentially and the identity of the respondent and household will be coded to preserve anonymity. The interview is expected to take about 60 minutes and the respondent may withdraw at any time.

If you agree to participate on these terms, please express your consent by writing your name and signing below.

I_____(name of participant) hereby confirm that I understand the terms of participation, and I agree to participate in this survey that will help World Vision Myanmar to design their project and to measure its impact.

Signature:_____ Date: _____

SURVEY QUALITY CONTROL

Township: _____ Tract: _____ Village: _____ Respondent No: _____	The respondent is the household head **Yes** / **No** OR The respondent is not the household head but participates in household decision making **Yes** / **No**

HOUSEHOLD ETHNICITY:

Burman	Karen		

ENUMERATOR'S NAME: _____

1 Household Characteristics

1.1 Size of household (family members or relatives who sleep here every day or at least on the weekends)

Males	Females	≤ 15 years	Adults 16 – 65 years		≥ 66 years	Attending school	Adults that work for wages or who are self-employed	
			Men	Women			Men	Women

1.2 In addition to these residents,
how many family members live and work somewhere else? _____

1.3 Information on the household head or a person responsible for financial decisions in the household.

Age in years	Gender (male or female)	Marital status[1]	Years of formal schooling	Years resident at this location

1. Married, never married, widowed or divorced.

1.4 Indicate the household's income sources and estimate the share contributed by the most important source last year:

Source of income	Yes or No	Share contributed by the largest source (%)
Farming (crops and/or livestock)		
Fishing		
Wage work on farms		
Non-farm salaries or wages earned by residents		
Income remitted by non-residents		
Own business enterprises		
Pensions and/or other welfare payments		

1.5 If the household earns income from its own business enterprises **other than farming or fishing**, what are the main enterprises?

(a) _____

(b) _____

(c) _____

1.6 Please estimate how much the household earned last year from its own business enterprises **other than farming and fishing**. _____Kyat

1.7 Please estimate how much the household earned last year from wage remittances and any pension or welfare payments it received._____Kyat

1.8 If the household trades, processes or uses products grown on local farms to generate income, how many people work in these enterprises?

_____Family members_____Hired workers

1.9 How many of these workers are women? _____

1.10 How many bedrooms does your house have? _____bedrooms

1.11 When the roads are dry, how much time does it take you to reach:

Destination	**Hours**
The nearest clinic or hospital	
The nearest petrol station	
The nearest place where you can buy fertiliser	
The nearest place where you can buy animal feed	

1.12 Indicate which of the following assets the household owns:

Household asset	**Number owned**	**Value if you sold them (Kyat)**
Car, van or truck		
Motorbike/scooter		
Generator or solar panels		[redacted]
Fridge or Freezer		
Mobile phone		
Television		

1.13 Does the household head or any member of the household have savings in a bank account or saving association?

Yes	**No**

1.14 If **yes**, which of the following best matches the household's total savings?

Range	Select one option
(1) Kyat < 140,000 (US$ < 100)	
(2) Kyat 140,000 – 1,400,000 (US$ 100-1000)	
(3) Kyat > 1,400,000 (>USD 1000)	

1.15 Are any of the members in the household a member of a farmer association or cooperative?

Yes	No

1.16 If **yes**, what is the name of the organisation(s)? _____

_____

1.17 If **yes**, does any member of the household play a leadership role in this organisation(s)?

Yes	No

2 Farm Characteristics

2.1 Does the household farm crops or livestock?

Yes	No

If **no**, skip to Section 3. If **yes**:

2.2 How much land did the household farm last year? _____acres

2.3 If the household hired or borrowed any of the land it farmed last year, how much land did it hire or borrow? _____acres

2.4 How did the household acquire its own farmland (e.g. inherited, purchased, allocated by a local authority, or a combination of these modes)? _____

_____

2.5 Could the household sell its own farmland if it wanted to?

Yes	No

2.6 Could the household rent its own farmland to someone else if it wanted to?

Yes	No

2.7 How much land is the household able to irrigate during the wet season?_____acres

2.8 How much land is the household able to irrigate after the wet season?_____acres

2.9 In your busiest time of the farming season how many workers does the household pay to help with farm work? _____

2.10 How many of these hired farm workers are women? _____

2.11 Crops grown and sold during the past year

Crops marketed	Area cultivated[1] (acres)	Revenue from sales[1] (Kyat)	Mostly sold to[2]	Time between decision to sell and payment (days)	Other buyers or markets readily available (Yes or No)
Paddy rice					
Upland rice					
Rubber					
Groundnut					
Betel leaf/nut					
Flowers					
Cashew					
Pineapple					
Sugarcane					
Watermelon					
Cucumber					
Gourd					
Other:					

1. If the respondent cannot provide an estimate, enter the answer as 'don't know'.
2. Traders who collect your products, Local millers or processors, Local farmers' organisation, People or shopkeepers in the village, Processors or shopkeepers in big towns, supermarkets in big towns.

2.12 Livestock and poultry raised and sold during the past year

Livestock products marketed	Revenue from sales[1] (Kyat)	Mostly sold to[2]	Time between decision to sell and payment (days)	Other buyers or markets readily available (Yes or No)
Pigs				
Chickens				
Ducks				
Eggs				
Dairy products				
Other: (specify)				

1. If the respondent cannot provide an estimate, enter the answer as 'don't know'.
2. Traders who collect your products, Local abattoir or processors, Local farmers' organisation, People or shopkeepers in the village, Abattoirs or shopkeepers in big towns, supermarkets in big towns.

2.13 Farming expenses incurred during the past year

Inputs purchased	Total cost[1] (Kyat)	Purchased from[2]	Borrowed cash to pay, or paid over time (Yes or No)	Source of credit[3]
Fertiliser				
Seed and seedlings				
Chemicals (e.g. weedicide & insecticide)				
Hire of machinery and equipment				
Hire of transport services				
Animal feed				
Veterinary medicine and services				
Livestock to fatten				
Farm labour				
Other:				

1. If the respondent cannot provide an estimate, enter the answer as 'don't know'.
2. Local shops or depots, Local farmers' organisation, Local contractor, Shops or depots in bigger towns, Traders who operate in town but deliver inputs that we order, Government agency, other (specify).
3. Friend or relative, local money lender, savings group, farmers' organisation, input supplier, a bank, an NGO or another source (specify).

2.14 Fixed and movable farm assets

Farm assets	Owned or partly owned (Yes or No)	Estimated replacement value[1] (Kyat)	Borrowed cash to pay, or paid over time (Yes or No)	Source of credit[2]
Irrigation equipment				
Shade house and/or trellis systems				
Crop storage facilities				
Cool room and/or cool boxes				
Chicken and/or pig houses				
Tractor and/or hand tractor				
Plough and/or harrow				
Threshing machine				
Milling machine				
Other significant farm assets:				

1. If the respondent cannot provide an estimate, enter the answer as 'don't know'.
2. Friend or relative, local money lender, savings group, farmers' organisation, input supplier, a bank, an NGO or another source (specify).

2.15 How much did your household spend on purchasing, building and maintaining these fixed an movable farm assets last year?_____Kyat

2.16 Can the household get farming advice when it needsto?

Yes	No

2.17 What is the agricultural advisor's name? _____

2.18 What organisation does this advisor work for? _____

2.19 Can the household get marketing advice when it needsto?

Yes	No

2.20 Were any agricultural training courses offered locally during the pastyear?

Yes	No

2.21 If **yes**, did any member of the household participate?

Yes	No

2.22 If **yes**, what organisations offered these courses? _____

2.23 Farming constraints

What are the three most challenging problems that prevent your household making a better living from farming?

(a) _____

(b) _____

(c) _____

3 Fishing Enterprises

3.1 Does the household earn income from fishing or from trading/processing fish or fish products?

Yes	No

If **no**, skip to Section 4. If **yes,** please answer the following questions:

3.2 Fish products sold during the past year

Fishing enterprise	Revenue from sales[1] (Kyat)	Mostly sold to[2]
Catch and sell fresh deep water fish and shellfish		
Catch and sell fresh inshore fish and/or shellfish		
Farm and sell fresh fish and/or shellfish		
Buy and sell fresh fish and/or shellfish		
Process and sell fish products		

1. If the respondent cannot provide an estimate, enter the answer as 'don't know'.
2. Traders who collect your products, Local processors, Wholesalers or retailers in the village, Wholesalers or retailers in big towns, Processors in big towns, Supermarkets in big towns.

3.3 If your household sells or processes fish, what does it do with by-products and fish that are not fit for human consumption?

_____

_____

3.4 What are the three most challenging problems that prevent your household making a better living from fishing?

(a) _____

(b) _____

(c) _____

4 Use of Credit

If the household borrowed cash to finance operating inputs used in its farming, fishing or other business enterprises, what sources of credit did it use, and which source would it prefer to use?

Lender	Used this source of credit (Yes or No)	Select the preferred lender
Bank		
Micro-finance company		
Money lender		
Savings group		
Friends or relatives		

5 **Food Security** – we are almost finished

5.1 What share of the rice consumed by the household last year was grown by the household itself? _____%

5.2 On how many days did members of your household eat the following foods during the past week?

Food type	**Number of days this food was eaten in the past week**	**Mostly produced by household (Yes or No)**
Rice, maize or bread (wheat)		
Potatoes, sweet potatoes, cassava or cooking banana (plantains)		
Beans, peas, groundnuts or cashews		
Vegetables or leaves		
Fruits		
Fish, poultry, pork, beef, goats or eggs		
Yoghurt or dairy products as a main meal		
Sugar, honey or sweets		
Vegetable oil, butter or fats		
Spices, salt, tea, coffee, fish powder, milk for tea		

5.3 Are there any times during the year when your household does not have enough food to eat?

Yes	**No**

5.4 If **yes**, during how many months of the year does this happen?_____months

We appreciate your help and patience. Thank you.

CHECK MOBILE PHONE SIGNAL

Good	Weak	Absent